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Allis-Chalmers
Manufacturing Company

Bulletin No. 1819 Mining Machinery Department **March, 1921**

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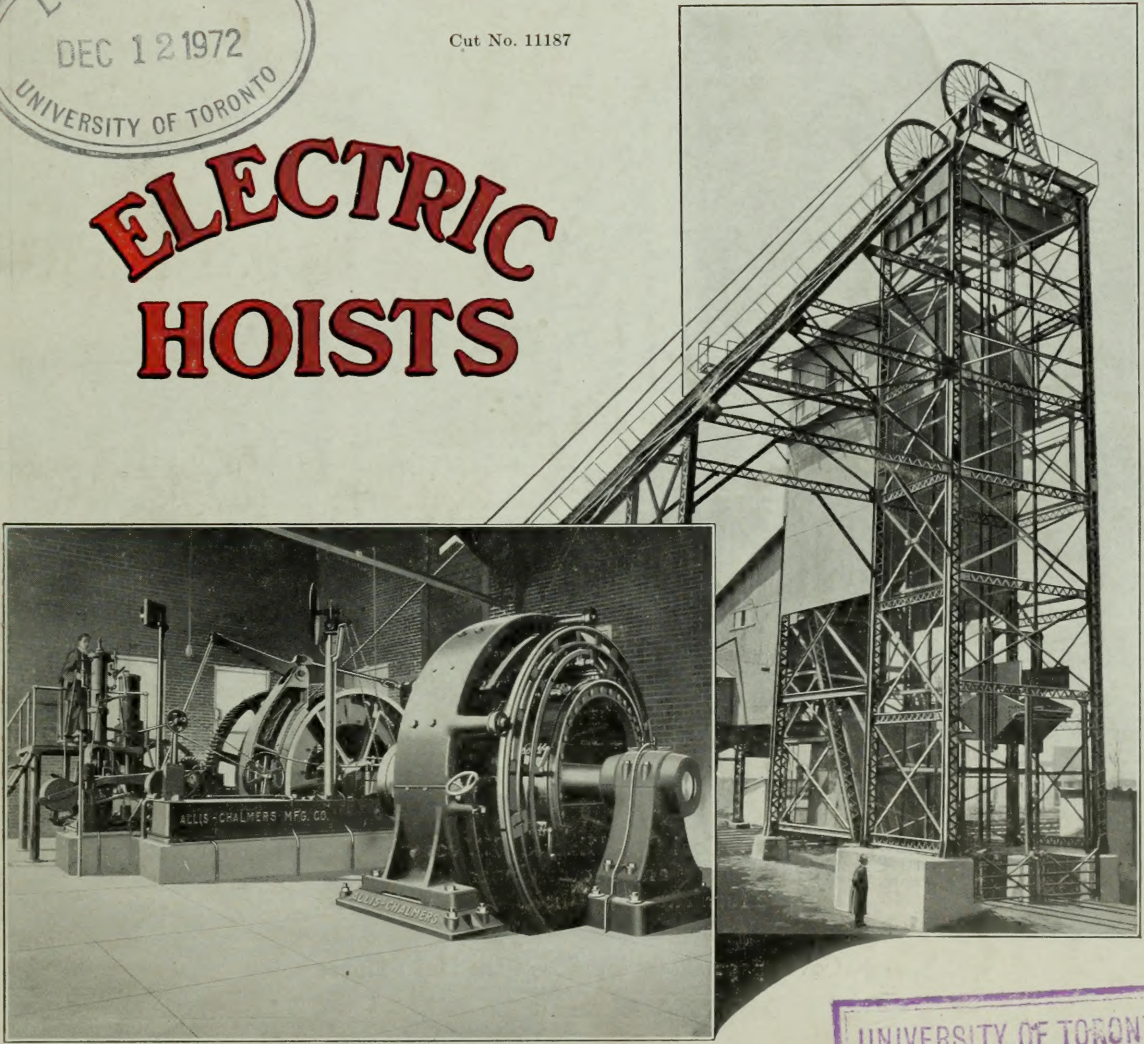
ELECTRIC HOISTS

Cut No. 11187



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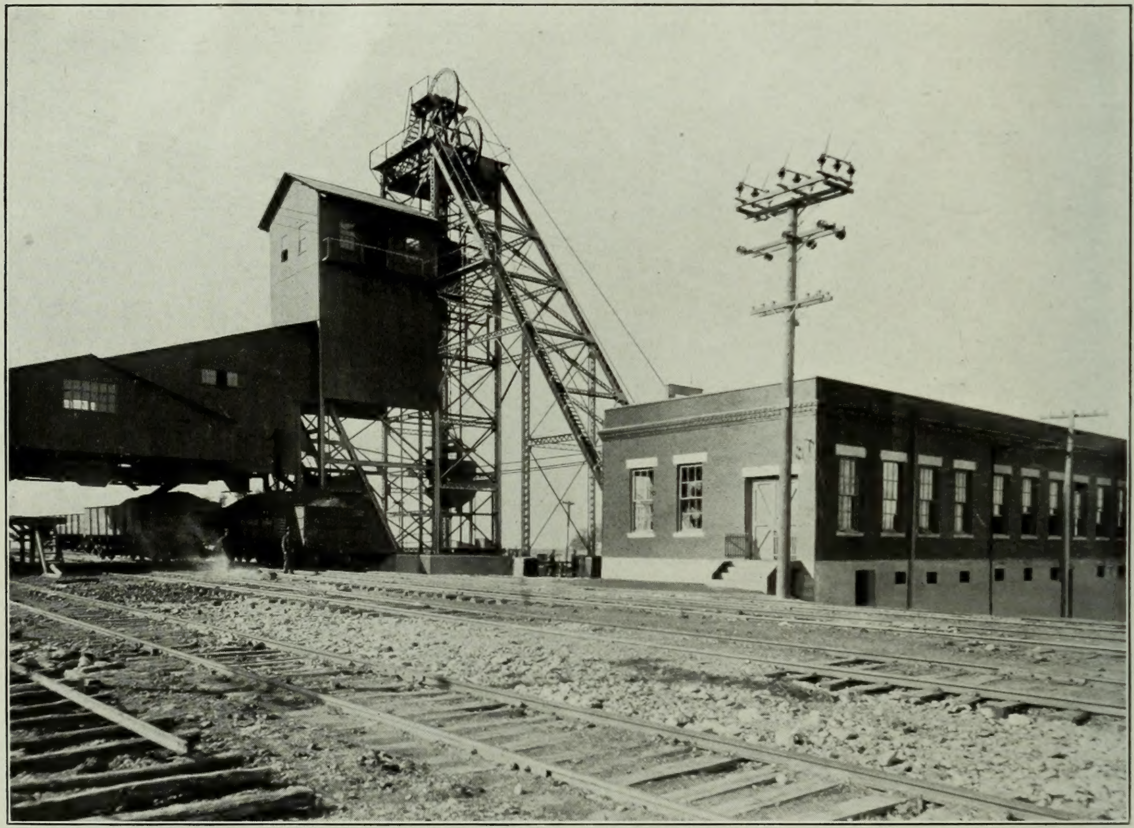


Hoisting Plant of the Peabody Coal Co., Kincaid, Ill. complete Hoist, Motor-Generator Flywheel Set, Switchboard and Motor Generator Sets for underground haulage furnished by Allis-Chalmers Mfg. Co.

Cover page shows interior of the Hoist House

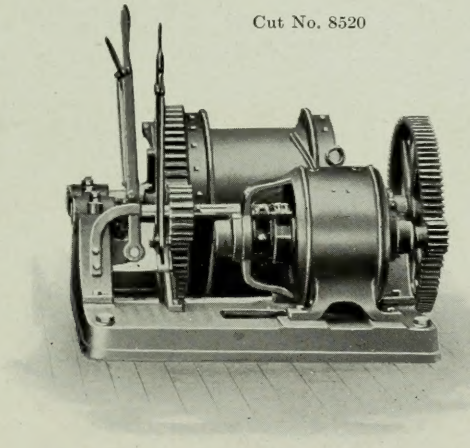
ELECTRIC HOISTS

The Allis-Chalmers Manufacturing Company presents this bulletin with the object of giving information to engineers, mine managers and those interested in hoisting equipment, to assist them in the selection of the type of hoist to meet their individual requirements.

A few only of the many types and designs of electrically operated hoisting equipments furnished by this company are illustrated.

Allis-Chalmers has been a leading builder of hoisting equipment for many years, having installed hoists in all the principal mining districts of the world. Its experience in designing and building hoisting equipment extends over a period of nearly a half century, covering the perfection of the steam hoist and the development of the electric hoist from its first application. Therefore, it is in a position to supply equipment designed to meet any special conditions. This company has always taken the initiative in the development of new features in design, adding to the safety, improving the operation and increasing the efficiency of its electric hoists.

No part of mine equipment is of greater importance than the hoist, as safety to life as well as output and cost of production depend upon it. Since no two hoisting problems are exactly alike, the selection of the proper equipment requires special engineering knowledge and experience. A complete discussion of the various details between the purchaser's and the company's engineers is recommended before making decision on a hoist installation. Allis-Chalmers places the services of its hoist engineering staff at the disposal of those contemplating the purchase of hoisting equipment. Its engineers will make a careful study of all the conditions and submit recommendations covering equipment best suited to the requirements.



2000 lb. rope pull, 200 ft. per minute rope speed Single Drum Electric Hoist, driven by 10 H. P. 220 volt D. C. Motor.

SMALL STANDARD HOISTS

For rope pulls up to and including 7,000 lbs., Allis-Chalmers offers a line of hoists of standard design which are driven by alternating or direct current motors. These units are built in the single drum type for capacities of from 2,000 lbs. to 7,000 lbs. rope pull, and in the double drum type of from 3,500 lbs. to 7,000 lbs. rope pull. These hoists are of very substantial compact and high grade design and must not be confounded with many of the cheaper types now on the market.

These hoists as shown by the illustration are supplied

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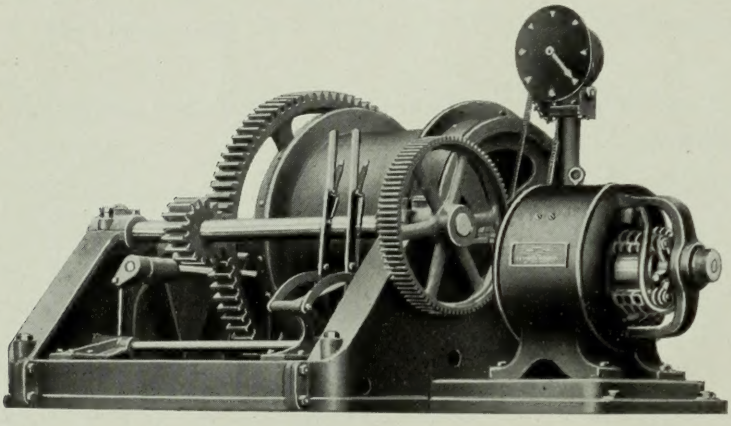
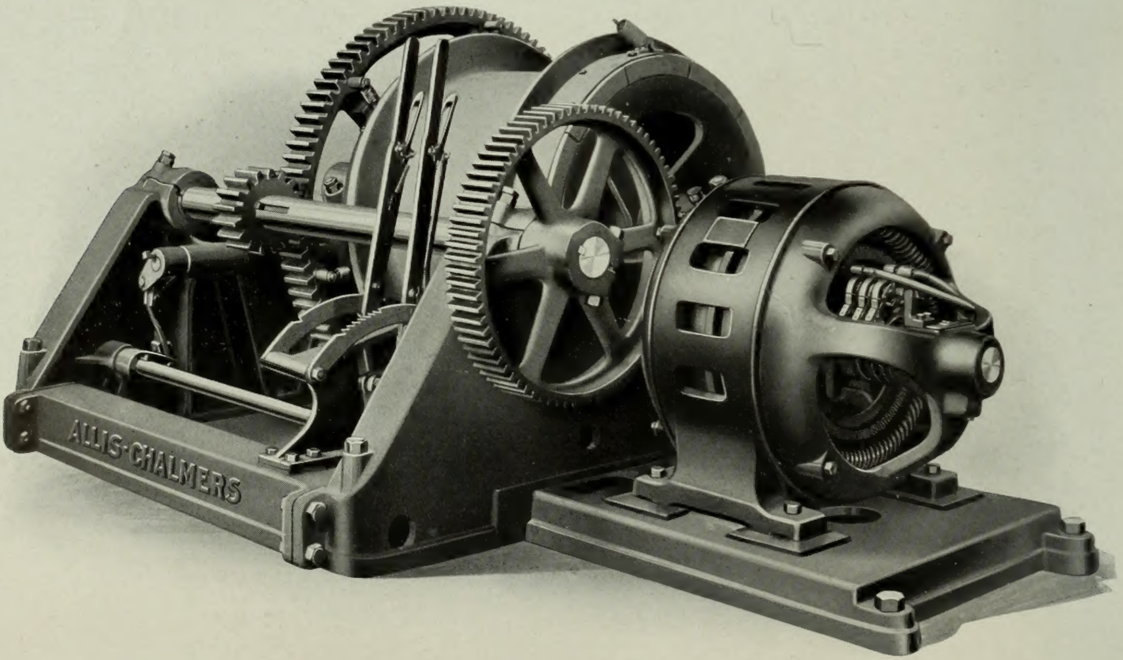


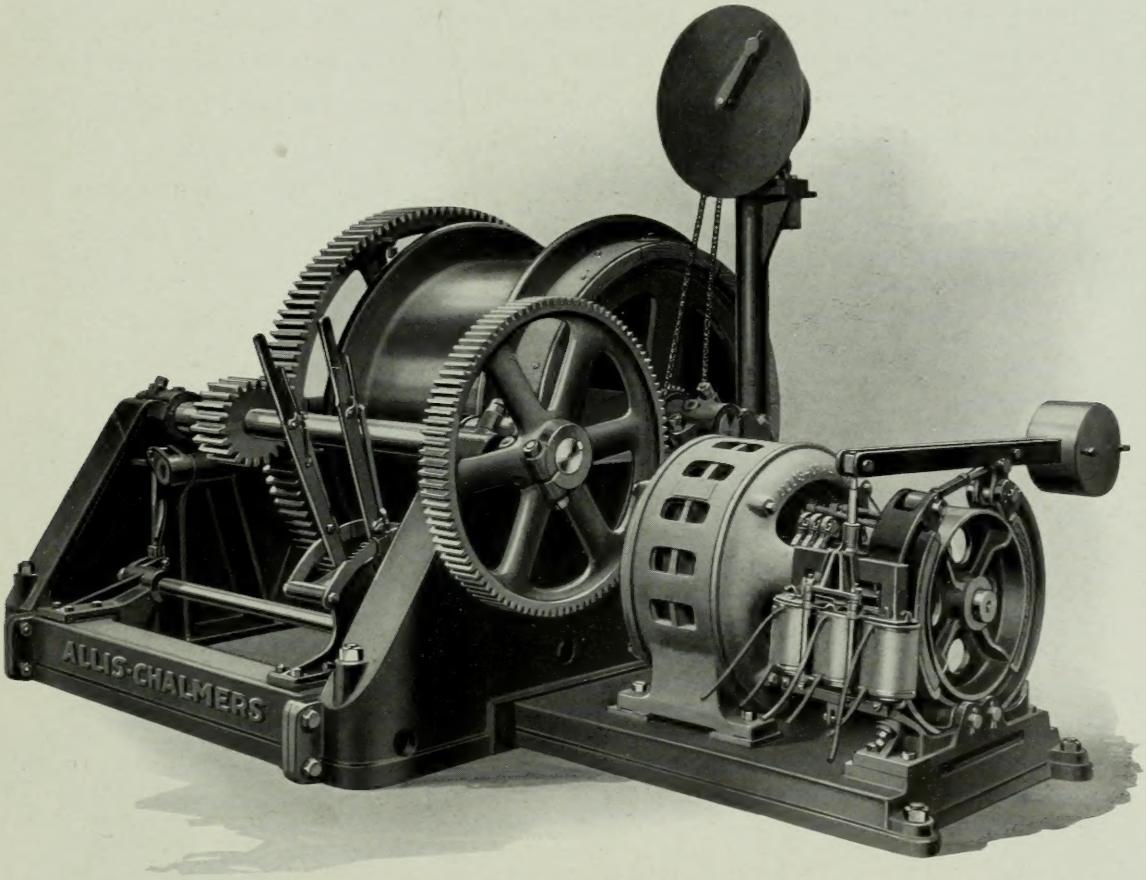
2500 lbs. rope pull, 350 ft. per minute rope speed, Single Drum Electric Hoist, driven by Direct Current Motor

Cut No. 11260



3500 lbs. rope pull, 400 ft. per minute rope speed Single Drum Electric Hoist, driven by 45 H. P., 440 volt, 60 cycle, 3 phase Wound Rotor Induction Motor with a self-contained frame and each drum is equipped with a hand operated band friction brake and a band friction clutch of the modified Lane type. They are all of the double reduction geared type, the teeth of all gears and pinions are machine cut from solid blanks. The gears are made of special gear iron and the pinions of cast steel. The drum surfaces are cast smooth and the flanges are designed for a maximum of six layers of rope. Dial indicators and overwind equipment are furnished with these units as extras. If the overwinding device is required, it is necessary to also include the dial indicator. The standard overwinding equipment includes a solenoid operated brake mounted on the motor shaft and a patented overwinding switch mechanism which

Cut No. 15815

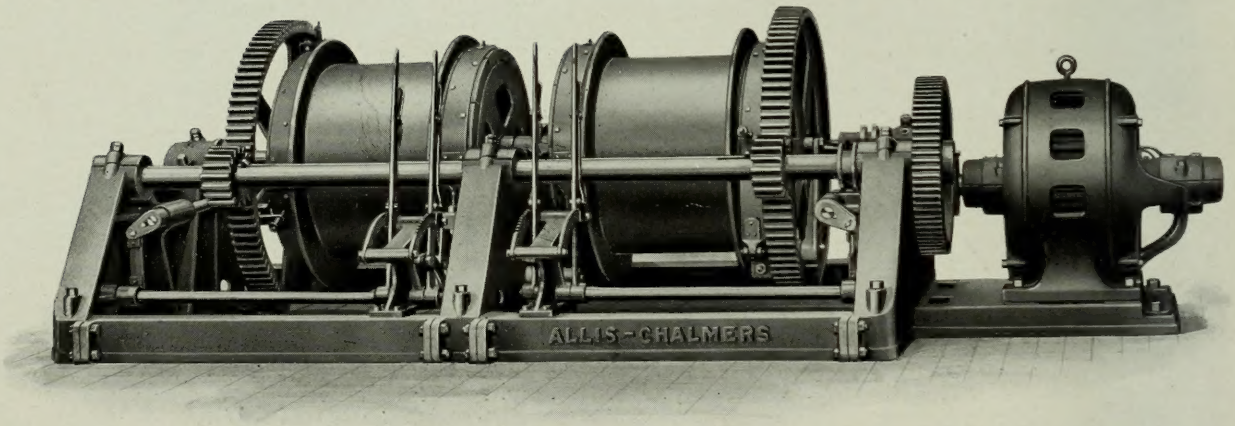


5000 lbs. rope pull, 400 ft per minute rope speed Single Drum Electric Hoist, driven by
75 H. P., 440 volt, 60 cycle, 3 phase Induction Motor and complete with
Dial Indicator, Safety Overwind and Solenoid Brake

is included with the indicator. The arrangement is such that in case of a predetermined amount of overwinding, the overwind mechanism trips a main line circuit breaker cutting off current both from the motor and from the solenoid brake. This permits the brake to set and bring the hoist to a stop.

The standard units are equipped with wound rotor induction motors although where required direct current motors can be supplied. Single drum hoists are equipped with hoist rated intermittent duty motor and double drum hoists with continuous duty rated motors. The controllers supplied with hoists equipped with motors under 100 H. P. capacity are of the reversible drum type with grid resistance designed for 50% speed variation with full load torque conditions. Hoists equipped with motors from 100 H. P. and above are supplied with the contactor type of controller. The company does not recommend drum type controllers for use in connection with hoist motors in excess of 100 H. P. capacity. The table gives the standard ratings and data for this line of hoists.

Cut No. 12421



5000 lbs. rope pull, 450 ft. per minute rope speed Double Drum Electric Hoist, driven by 220 volt, 25 cycle, 3 phase Wound Rotor Induction Motor

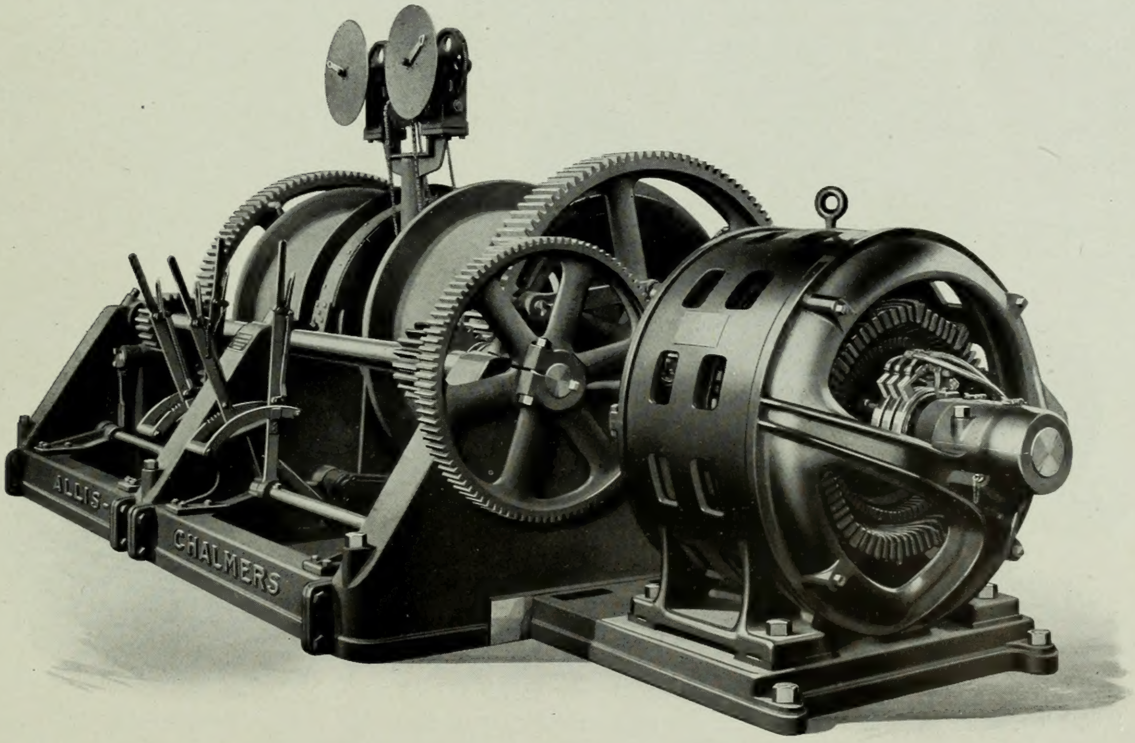
SINGLE DRUM

Rope Pull at drum	Rope Speed ft. per min.	Dia. Drum	Face Drum	Dia. Rope	Feet Rope 6 layers	H. P. Motor	Type Controller	Approx. Weight
2000	250	24″	16″	½″	1200	15	Drum	4000
2500	350	28″	18″	½″	1690	30	Drum	6300
3500	400	32″	22″	⅝″	1820	45	Drum	8500
5000	450	42″	28″	¾″	2650	75	Drum	11600
7000	600	48″	30″	¾″	3240	150	Contactor	20300

DOUBLE DRUM

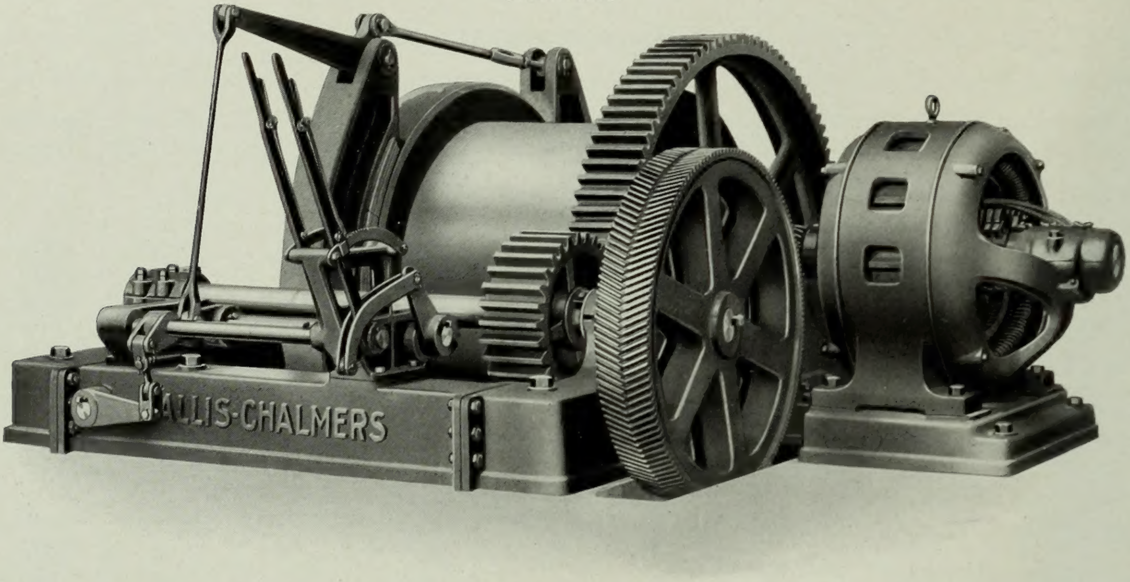
Rope Pull at drum	Rope Speed ft. per min.	Dia. Drum	Face Drum	Dia. Rope	Feet Rope 6 layers	H. P. Motor	Type Controller	Approx. Weight
3500	400	32″	22″	⅝″	1820	30	Drum	13200
5000	450	42″	28″	¾″	2650	50	Drum	19200
7000	600	48″	30″	¾″	3240	100	Contactor	31500

Cut No. 11259



7000 lbs. rope pull, 600 ft. per minute rope speed Double Drum Electric Hoist, driven by 100 H. P., 440 volt, 60 cycle, 3 phase Wound Rotor Induction Motor

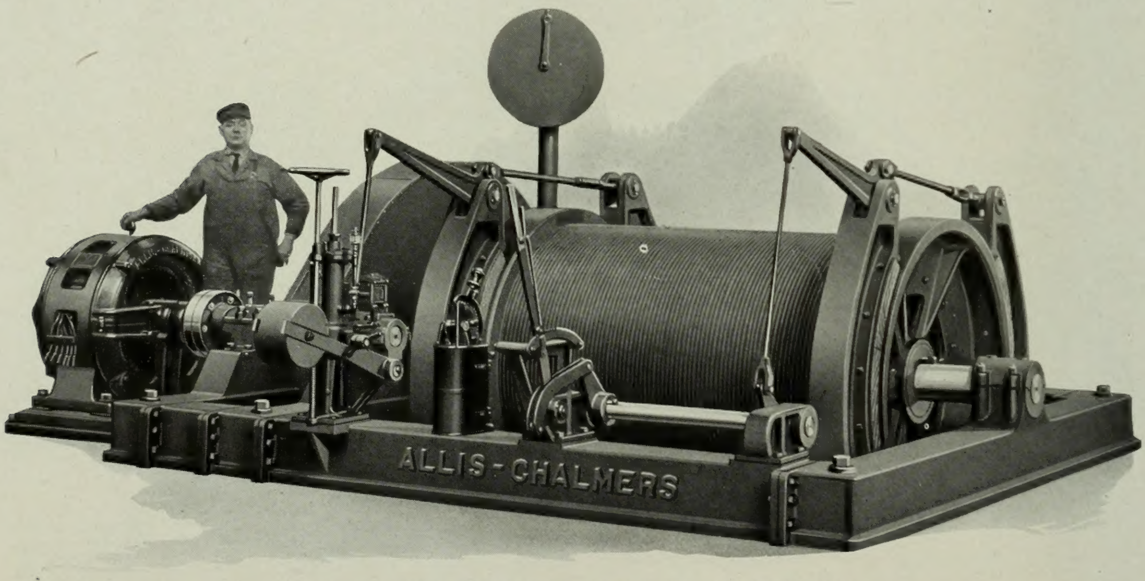
Cut No. 12317



BUILT FOR PACIFIC ROCK AND GRAVEL COMPANY

9,000 lbs. rope pull, 360 ft. per minute rope speed single drum hoist equipped with hand operated post brake and Lane clutch. Main gear reduction spur type, intermediate gear reduction Falk type. Hoist is driven by a 125 H. P., 440 volt, 50 cycle, 580 R. P. M., 3 phase induction motor with drum type controller.

Cut No. 13632



BUILT FOR VERONA MINING COMPANY

8,000 lbs. rope pull, 500 ft. per minute rope speed balanced single drum hoist, having one rope wind on as the other unwinds. The hoist is equipped with two post brakes. One brake is operated by a hand lever, the other is for emergency use and is operated by a special brake setting device. The hoist is supplied with a single reduction of Falk gears and with complete safety devices. It is driven by a 50 H. P., 2,200 volt, 60 cycle, 3 phase, 435 R. P. M. induction motor with magnetic controller.

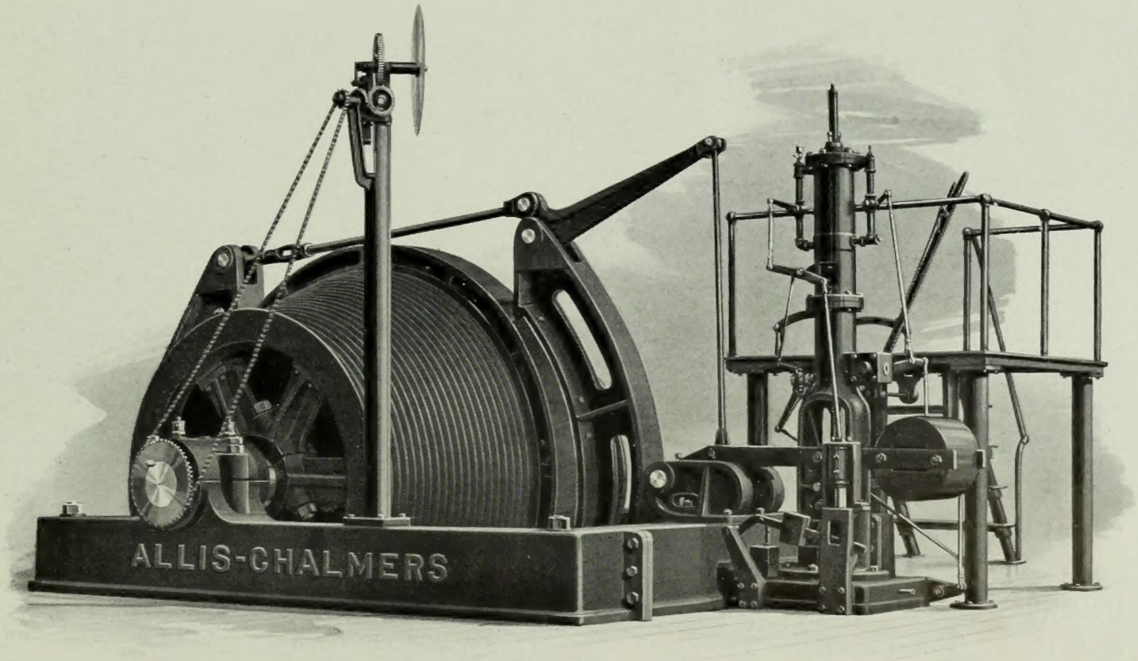
LARGE MINE HOISTS

Where the rope pull is in excess of 7,000 or 8,000 lbs. conditions are generally such as to warrant a special hoist. On the following pages are illustrated various types of hoists, designed and built by Allis-Chalmers which are in successful operation. They are chosen from many which have been built to give an idea of the variations in design in order to meet individual requirements. Since mining practice and operations of metal mines are radically different from those of coal mines, it follows that the hoists are generally of a different type.

Hoisting conditions vary so widely that the type of the hoist and the system of hoisting must be laid out to meet the special requirements in each case, in order to secure the safest as well as the most economical hoist, both from the standpoint of installation as well as low operation costs. The services of the company's engineers are at the disposal of those who require information on any hoisting problem and requests for advice as to the type and system best suited to meet stated requirements will receive careful consideration.

Space will not permit illustrating and describing all details, therefore, only a few of the more important parts entering into the design of Allis-Chalmers electric hoists will be shown.

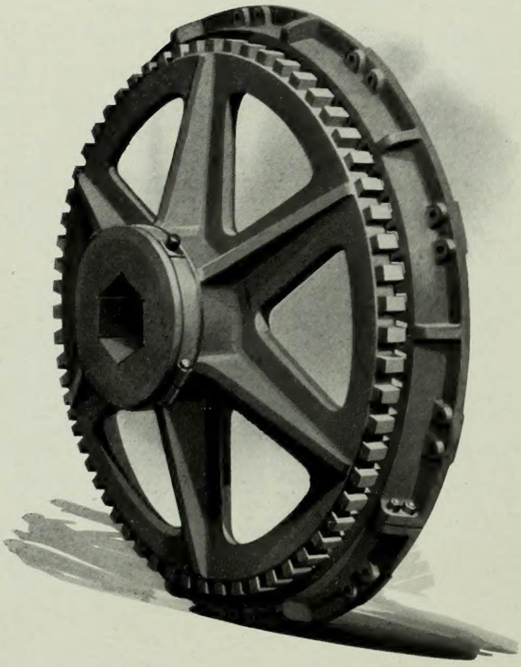
Cut No. 11098



BUILT FOR NEW RIVER & POCAHONTAS CONSOLIDATED COAL COMPANY

12,000 lbs. rope pull, 1870 ft. per minute average rope speed double conical drum hoist, equipped with post brake operated by air engine, dial indicator and safety overwind. Hoist drum shaft is coupled to direct current motor.

Cut No. 12612



Multiple Tooth Clutch

The frames of Allis-Chalmers hoists are of the inverted "U" type usually furnished on three sides only with machined surfaces to which all details are bolted. This permits of carefully assembling and fitting all parts at the factory and facilitates erection at destination.

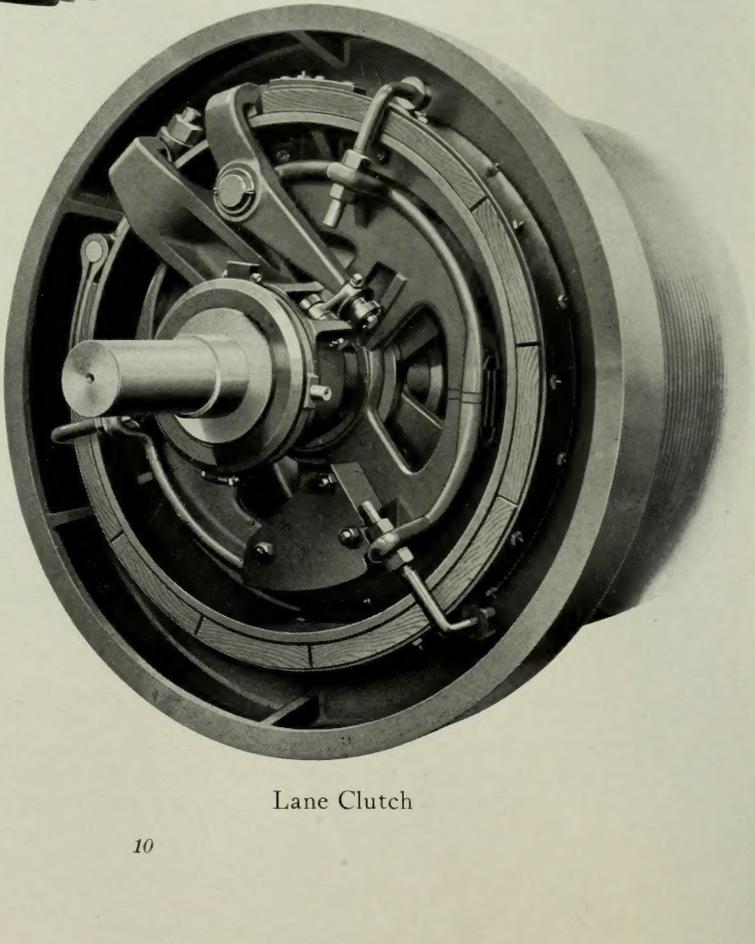
The drum shaft bearings are of the heavy duty type lined with high grade babbitt metal, ample provision being made for lubrication to insure cool operation. Where desired and especially on larger sizes they are made with removable shells. The pinion shaft bearings are of the self-oiling type with removable babbitt lined shells. The drum shaft bearings are usually provided with grease cup lubrication but where desired oil flood lubrication may be used in which case an oil and filtering system is required.

Allis-Chalmers hoists are furnished with drums of either the cylindrical, conical, cylindro-conical type or with reels. Examples of all of these types are illustrated in this bulletin.

Clutches are of three distinct types to meet varying conditions.

Cut No. 12612 shows a multiple tooth clutch. The driving and the driven members are usually made of cast steel, each having cut teeth which are accurately machined to insure equal distribution of pressure on the

Cut No. 16056

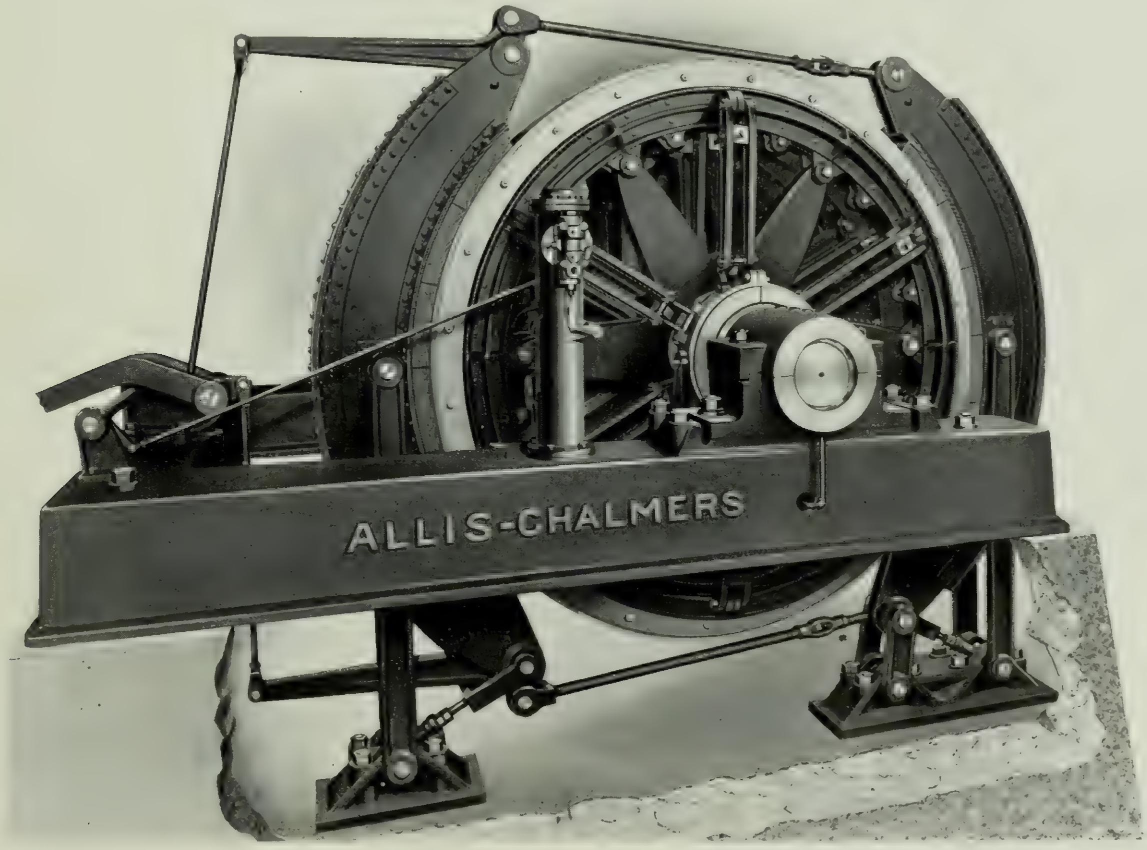


Lane Clutch

teeth. The driven member is fastened to the drum spider. The driving member slides on the shaft and revolves with it. Sometimes the hub is machined hexagonal, as shown by the cut, and slides on a hexagon portion of the shaft which is enlarged a trifle over the shaft diameter, while in other cases the hub is bored out and feather keys are used for driving.

Allis-Chalmers improved Lane friction clutch is shown by cut No. 16056. It consists of a spider, keyed to the drum shaft, a fixed and a movable arm, a friction band and a sliding sleeve. On the smaller sizes, the fixed arm is cast as an integral part of the clutch spider. On larger sizes it is made separate and bolted to the spider. The movable arm is attached to the spider by means of a pin. The adjustable friction member is a steel band, accurately rolled to shape, lined with removable basswood blocks. One end is anchored to the fixed arm and the other to the outer end of the movable arm. Motion is imparted to the movable arm through the sliding sleeve. Rollers are provided to obtain equal release of the band and to prevent dragging on the clutch wheel.

Cut No. 16152



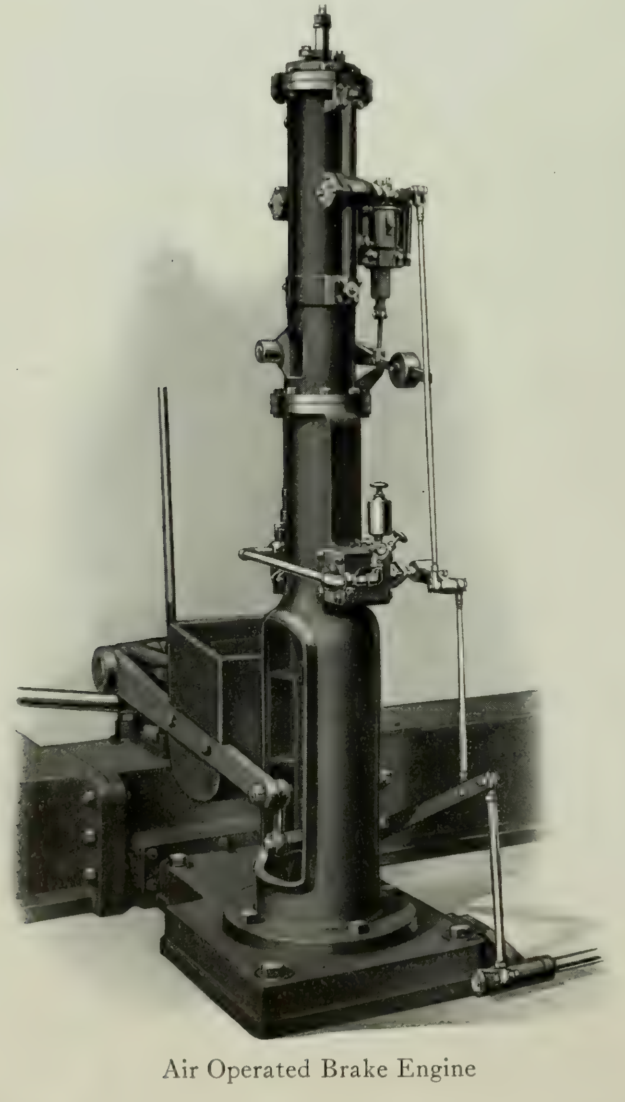
Double Disc Multiple Arm Clutch

Cut No. 16152 shows the Brown heavy duty multiple arm friction clutch. This clutch consists of a driver keyed to the drum shaft, two ribbed rings to which friction blocks are attached, toggle levers for the rings, a steel clutch ring fastened to the drum and a sliding sleeve. The driver is made with arms designed for driving at their outer ends. The ribbed rings are attached to the outer ends of the arms and are actuated through powerful toggle levers, motion being imparted to them by the sleeve which slides on the driver hub. The clutch is designed so that the rings release equally on both sides, so as not to drag when the clutch is disengaged. This clutch is self-locking when engaged and in addition is so designed that there are no strains or any pressure produced tending to disengage the clutch. This is an extremely powerful clutch with an exceptionally high factor of safety and operates equally well for either direction of rotation.

Brakes are of either the band or post type. On the larger hoists the parallel motion post type is recommended. Cut No. 16152 shows a parallel motion brake with the posts of the built-up structural steel design. This illustrates the best type and design of brake. An auxiliary brake is sometimes mounted on the pinion shaft and operates in connection with the main brake on the drum. This auxiliary brake is intended to absorb a part of the energy of the revolving masses on the pinion shaft when stopping the hoist.

The brake engine of the air actuated type is shown in Cut No. 15698. This air engine has an oil cataract cylinder tandem to the air cylinder so as to insure smooth operation. Cut No. 16140 illustrates the oil operated brake engine. As seen from the illustrations, both engines are of the vertical single-acting type. A weight sets the brake by gravity and the brake engine is employed to raise the weight releasing the brake. Both types are provided with a floating lever mechanism which makes the motion of the piston co-incident with

Cut No. 15698

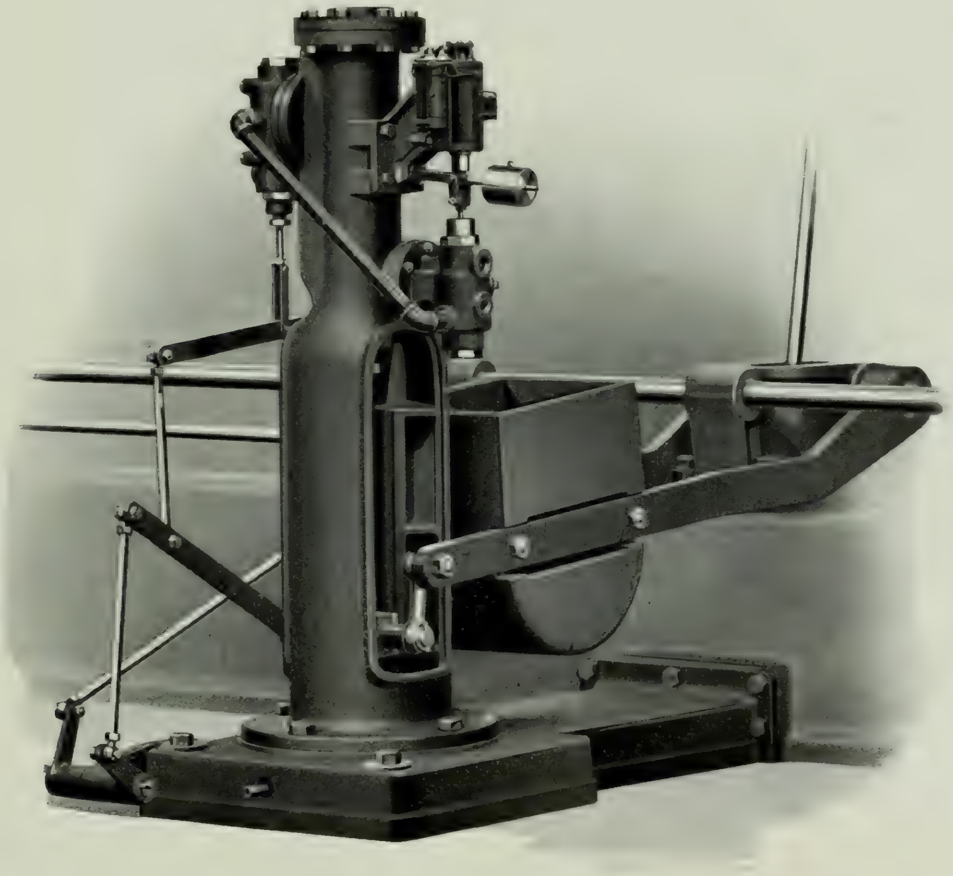


Air Operated Brake Engine

that of the operator's hand lever, so that any brake pressure may be applied, maintained and controlled at any point. The engines are equipped with auxiliary solenoid operated valves designed to automatically apply the brake in case of failure of either the electric power, or the pressure while hoisting.

In addition, the auxiliary valves are employed to apply the brakes automatically in conjunction with the overwind, overspeed and other safety devices.

Cut No. 16140

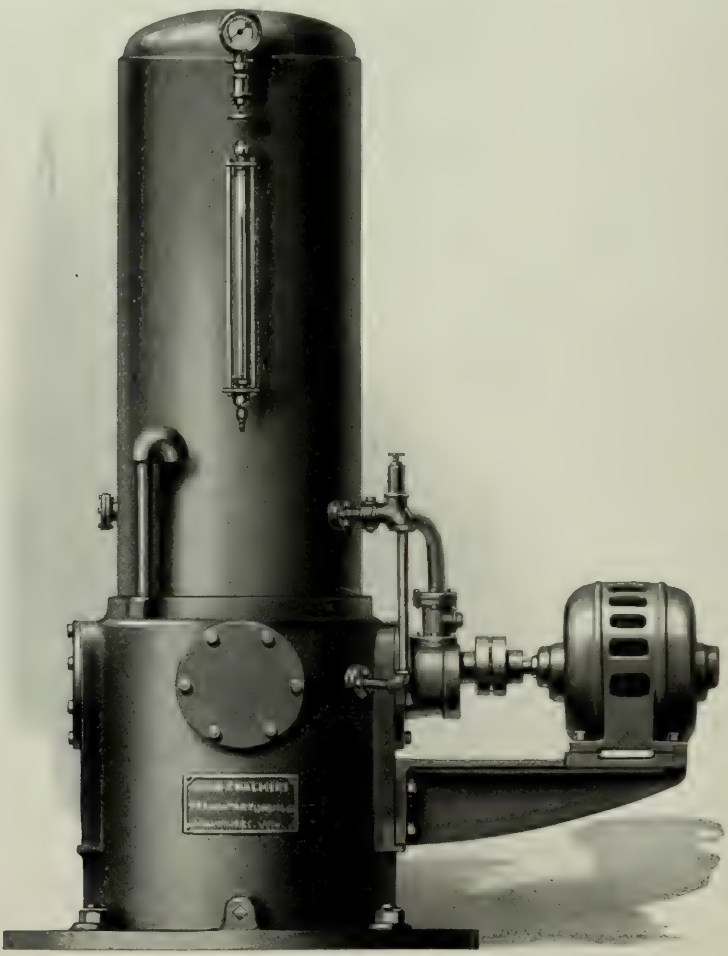


Oil Operated Brake Engine

For operating the clutches, air or oil operated clutch engines can be furnished. These are of the vertical double-acting type. The air operated clutch engine has an oil cataract cylinder to give smooth action to the clutch.

To operate oil actuated brake and clutch engines, Allis-Chalmers has developed an oil pressure system in various sizes. The use of the weighted type of accumulator has been discontinued as it has many objectionable features. As a general rule they are of an unsightly appearance because it is practically impossible to prevent oil leakage around the gland of the plunger. The larger sizes, even with double pumping units, have a limited capacity and take up considerable space. The oil pressure system, as built by this company, is entirely self-contained and if desired can be furnished with two pumping units. The pump is of the rotary gear type and is the safest and simplest means for producing oil pressure. There are no stuffing boxes and no suction or discharge valves used, so that the pump requires neither attention nor up-keep. A pet cock is provided in the suction side of the pumps through which the desired amount of air is drawn in by the pump with the oil and compressed to the required pressure. One pump is usually sufficient for this system. For the weighted accumulator system the pump and motor is always supplied in duplicate on account of the necessity for frequently packing the pumps, so that by having these parts duplicated, one is always ready for service. All this, together

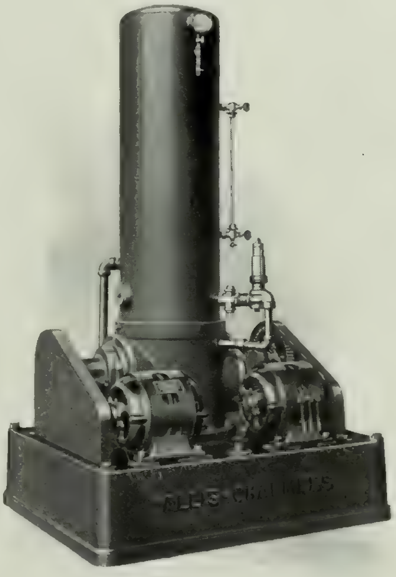
Cut No. 16150



Oil Pressure System—Motor Direct Connected with the time and expense involved, is eliminated with the system. An oil pressure system, as applied to the operation of brake and clutch engine, is no experiment as a similar system has been used successfully for years in operating the governors on Allis-Chalmers hydraulic turbines. Cut No. 16150 shows the latest design of oil pressure system. This is equipped with one pump and one motor directly connected through a flexible coupling. The unit is designed so that if desired, a second pump and motor can be added at any time to the unit on the side opposite to the one shown in the cut. Tests made on systems installed, have been beyond all expectation as regards reliability and capacity.

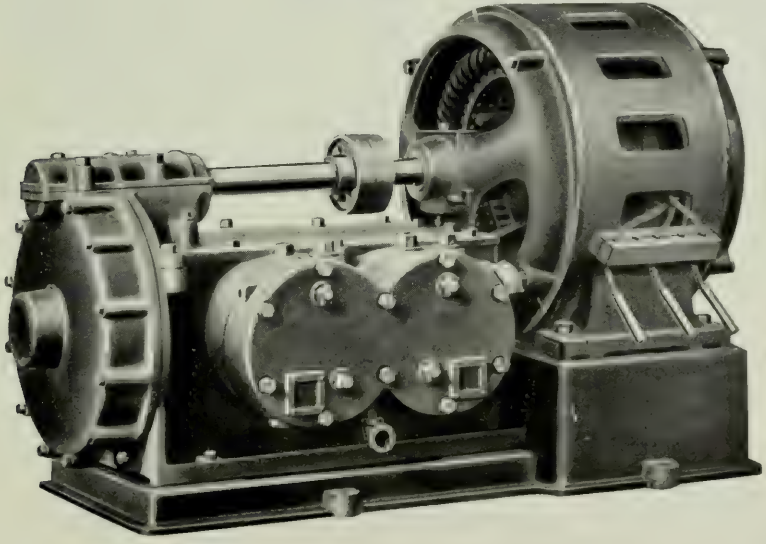
Cut No. 14975 shows another design of oil pressure system which we have supplied with electric hoists. This unit differs from the above in that the pump is driven by a silent chain, instead of being directly connected to the motor.

Cut No. 14975



Oil Pressure System—Silent Chain Drive

Cut No. 12164



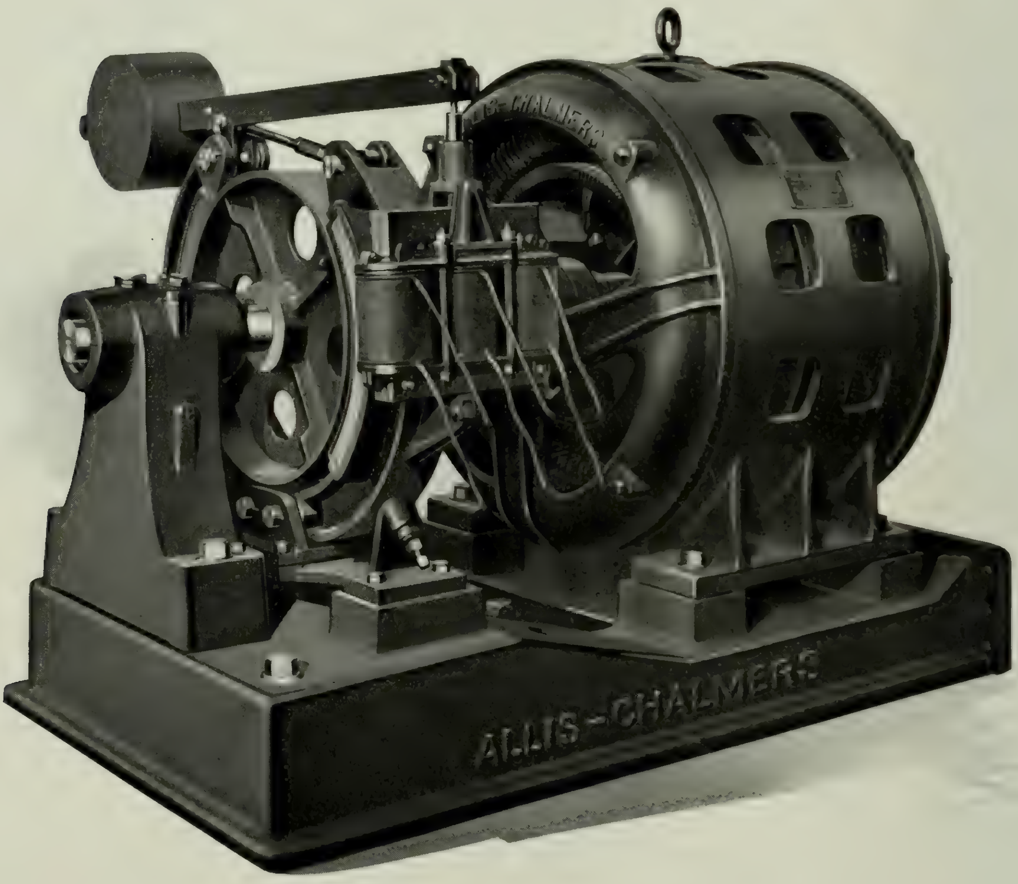
Allis-Chalmers Air Compressor

Compressed air for the air operated brake and clutch engines can be taken from the mine supply where it is available at a pressure from 85 to 100 lbs. Where compressed air is not available, a motor driven air compressor with suitable air storage tanks can be furnished.

Cut No. 12164 shows one of Allis-Chalmers air compressor units as furnished with electric hoists.

Solenoid brakes can be supplied mounted on the pinion shaft or motor shaft extension. On smaller hoists where the main brakes are hand operated, the solenoid brake can be arranged to operate in connection with the safety devices to stop the hoist automatically. Cut No. 13623 shows the Allis-Chalmers solenoid operated post brake. This brake is set by a weight and is released when the solenoids are energized.

Cut No. 13623



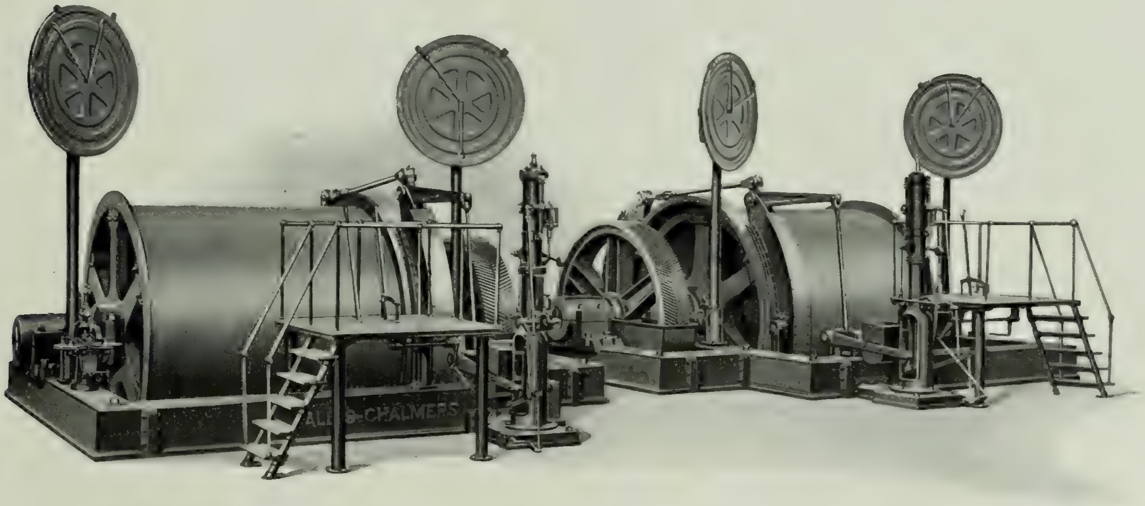
Allis-Chalmers Solenoid Brake

Indicators of the dial type are usually furnished with large hoists. When desired column type can be supplied. Special attention is directed to the indicators shown on the large hoists which have dials made of pressed steel reinforced with a polished rolled ring on the outer circumference. This construction makes a very substantial indicator of pleasing appearance and of comparative light weight.

Cut No. 15738 shows this type of dial. The indicators can be arranged to be driven from the drum hubs by means of cut tooth gearing with the necessary shafts and bearings or by cut tooth sprockets and diamond steel chains.

The hand levers or hand wheels for operating the brakes and clutches are arranged conveniently for the operator. On many hoists only one hand lever has been supplied for operating both the brake and clutch engine for each drum. This is done only with double drum hoists, where either one or both drums are provided with clutches. This single operating lever with forward and backward movement operates the brake, the extreme forward movement releasing the brake and the extreme backward movement setting the brake. When the lever is in the position with the brake set, it can be moved sideways which will disengage the clutch. This arrangement interlocks the brake and clutch so that it is impossible to disengage the clutch without first setting the brake and likewise the clutch must first be engaged before the brake can be released. The above arrangement is desirable in many instances and has the advantage that the drum can never get out of control and permit a cage or skip to be dropped to the bottom of the shaft.

Cut No. 15738



Single Drum Hoists built for Oliver Iron Mining Company

SAFETY FEATURES

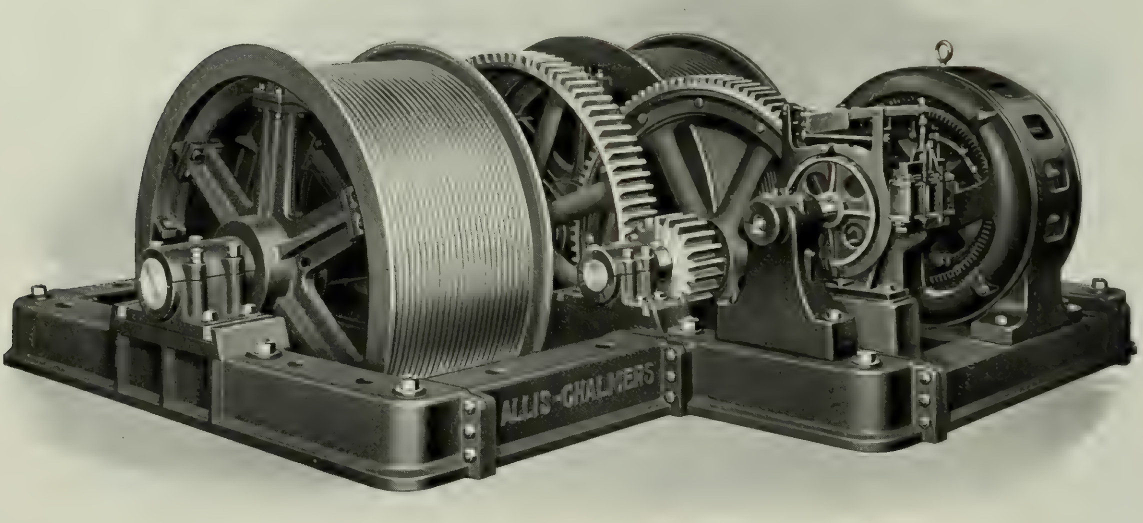
It may be generally stated that apparatus of the utmost reliability is necessary for mining work, because of the lives that are at all times subject to more or less danger underground and in going to and from the workings. This necessarily leads to the use of safety devices of many kinds especially in connection with hoisting equipment. Allis-Chalmers has developed a complete line of reliable devices to give the necessary safety protection by means of which the hoist will be stopped automatically in case of overwinding, overspeeding, serious overload, power failing while hoisting or in case the brake blocks become excessively worn and are not kept properly adjusted. In the event that the hoist is stopped automatically, due to any of the above causes, the operator must bring all operating levers to their normal position before he can resume hoisting. If the hoist has been automatically stopped due to an overwind, it cannot be started again in the same direction. Of necessity, a part of the safety features on a hoist must operate mechanically and a part electrically, and as Allis-Chalmers manufactures both the mechanical and the electrical parts, all details of such important devices are properly combined and co-ordinated. Where desired there can be incorporated with the hoists any patented safety devices as the purchaser may desire.

A recording instrument can be supplied which will record the time of beginning and ending of each trip; the exact time and duration of all delays; the level the hoist was made; the total trips per day and all signals given.

AUTOMATIC HOISTS

There are many instances where it is decidely advantageous to install electric hoists which are more or less automatic in operation. Allis-Chalmers has designed and built a large number of this class of hoists. Cut No. 10650 shows a type of automatic hoist installed at a number of the large stone quarries. This type of equipment is used in place of conveyors. The upkeep costs of the automatic hoist over the conveyor are decidedly in favor of the hoist.

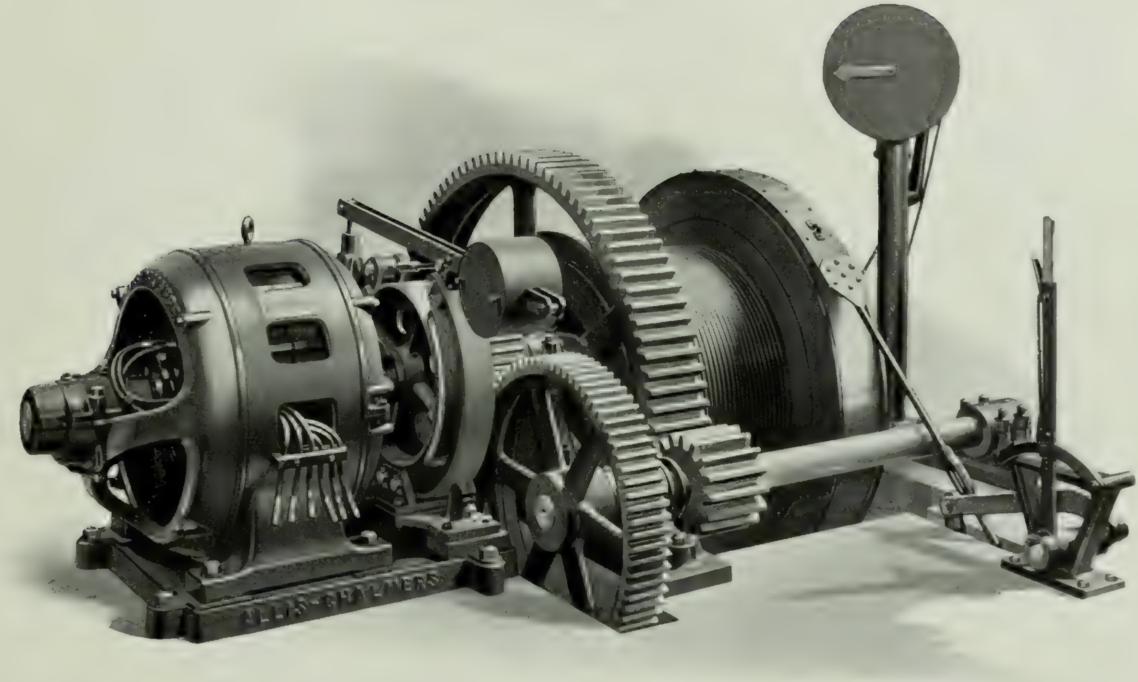
Cut No. 10650



Automatic skip hoist driven by an induction motor
24,300 lbs. rope pull, 375 ft. per minute rope speed

This type of hoist is brought to speed automatically and towards the end of the trip it is slowed down and then brought to a complete rest by the solenoid brake.

Cut No. 13638



Semi-Automatic hoist driven by an induction motor
9,000 lbs. rope pull, 500 ft. per minute rope speed

Cut No. 13638 shows a type of semi-automatic hoist which has been installed and is in successful operation at a number of iron ore mines. This type is designed so that it can be started either from push button stations at the bottom of the shaft or by an operator at the hoist. By means of a transfer switch the control of the hoist can be transferred from the hoist to the bottom of the shaft or vice versa, making it impossible to operate the hoist from the two points at the same time. When operating from push button stations at the bottom of the shaft, the hoist is started and automatically brought to speed and automatically slowed down toward the end of the trip; then brought to a complete rest by the solenoid brake. The band brake and the master control at the hoist are only used when equipment is being operated at this point. In this case the operation is similar to an ordinary induction motor driven hoist.

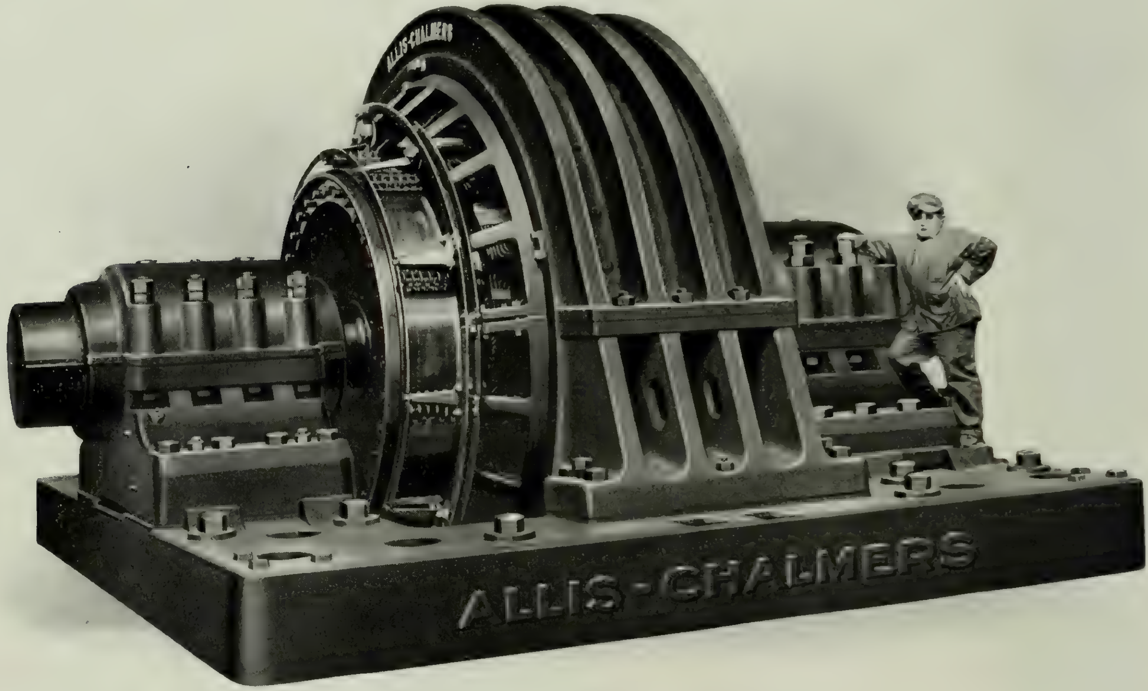
ELECTRICAL EQUIPMENT FOR HOISTS

Allis-Chalmers design and manufacture both the mechanical and electrical parts of a hoist. This is very important, especially in connection with an electric hoist where there are so many inter-connected details between the mechanical and electrical parts which should be taken care of by one engineering and manufacturing organization controlling the production of the entire equipment.

Many large induction motor driven hoists have recently been installed and are in successful operation in some cases power is taken from the mining company's power plant, in others from central stations. Where a considerable number of induction motor driven hoists are supplied from one power station, the operation of the hoists generally so overlaps as to obtain a fairly good load factor without excessive peaks, consequently line disturbances due to starting hoists are minimized. Results recently obtained clearly indicate the feasibility of connecting large induction motor hoists to central station lines without causing serious line fluctuations or disturbances, especially where Allis-Chalmers liquid controllers are used in connection with the motors.

Allis-Chalmers build a complete line of direct current equipment for use in connection with hoists. On smaller units series wound motors are used. In some instances conditions require compound wound motors. Cut No. 14792 shows a heavy duty shunt wound interpole motor suitable for direct coupling to the shaft of the hoist.

Cut No. 14792

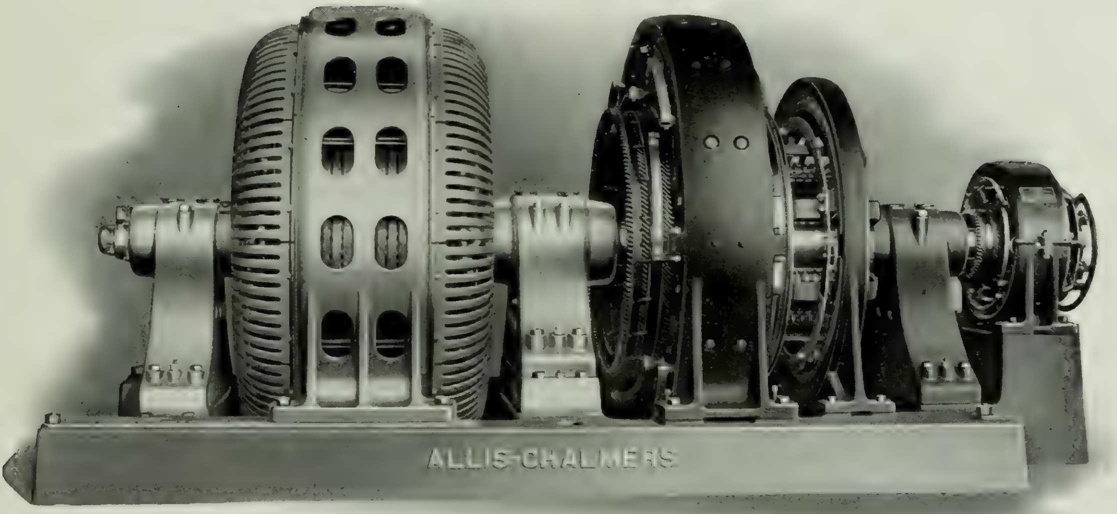


Direct Current Shunt Wound Interpole Motor

In some instances it is desirable to use a separate motor generator set for supplying power to the hoist motor in order to employ the Ward-Leonard type of control. In this case a shunt wound motor is used for driving the hoist, the speed and direction of rotation of the hoist motor is affected by varying and reversing the field current of the generator of the set. By this system of control the power is saved which ordinarily is dissipated in the starting resistance where the main circuit passes through the controller. Cut No. 10904 shows a set suitable for use in connection with this type of hoist.

In case of extremely large hoists or high speed hoists operating in shallow shafts, the average power requirements over the hoisting cycle are generally small with very large peaks at starting. To equalize these widely varying load conditions and to reduce the peaks at starting, equalizing systems are employed. The one most commonly used is the so-called Ilgner system. In this system the hoist is equipped with a direct current

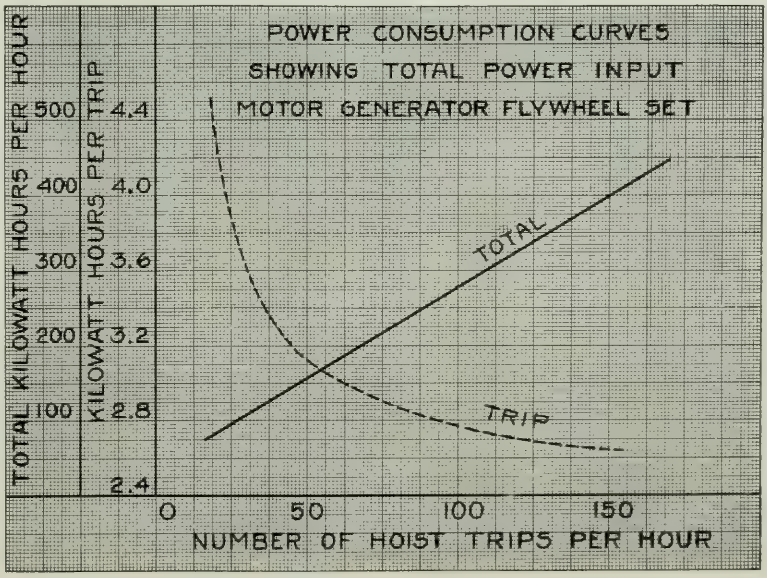
Cut No. 10904



Motor Generator Set suitable for use with Direct Current Motor Driven Hoist with Ward Leonard Control

shunt wound motor receiving power from a motor generator fly-wheel set. The control of the hoist itself is obtained in the same manner as described above, that is, by field control of the generator. The fly-wheel set is supplied with an automatic regulator which varies the speed of the set so as to take energy from the wheel during the peak load period and to restore energy to the wheel after the peak load period is passed. Cut No. 11106 shows the fly-wheel set supplied in connection with the hoist installation illustrated on the cover page of this bulletin.

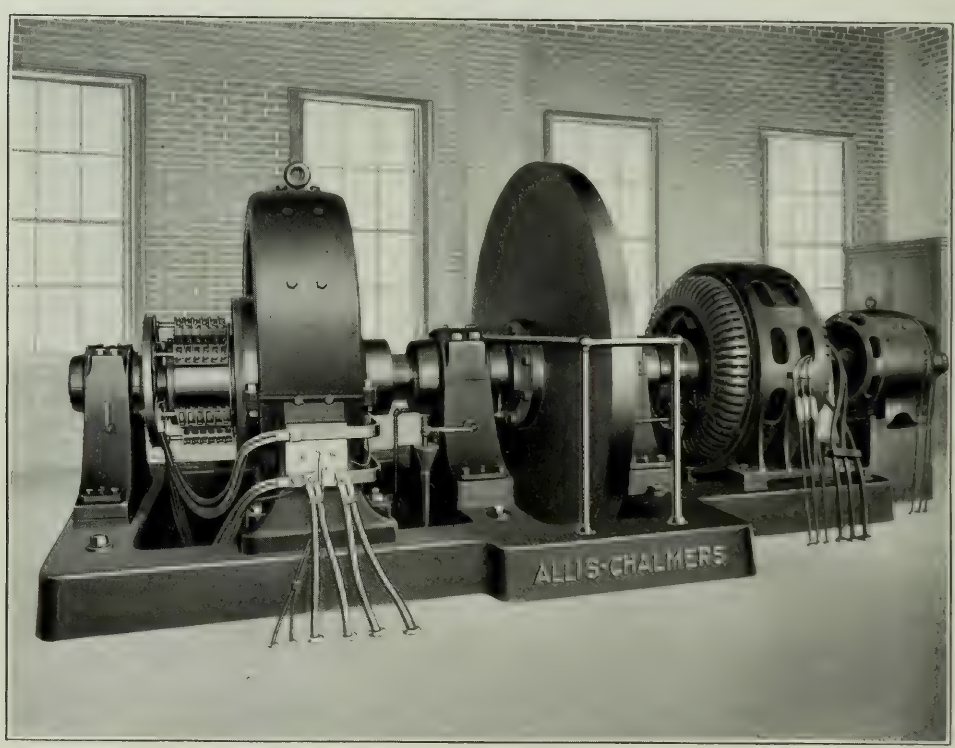
Cut No. 12292



In order to maintain the highest economy, it is necessary, where equalizing sets are employed to operate the hoists continuously in accordance with a calculated cycle, otherwise the constant no-load losses of the set will greatly increase the chargeable kilowatt hour power consumption per ton of ore hoisted. This is clearly illustrated by cut No. 12292, which shows the power consumption for a hoist operating from an equalizing set where the entire equipment was designed to hoist 144 trips per hour. When operating under these conditions, the power consumption per trip as seen from the curve amounts to 2.65 kilowatt hours. Assuming only 50 trips were made per hour, the chargeable power consumption per trip amounts to 3.12 kilowatt hours due to the addition of the constant standby losses.

The hoist shown on the cover page is equipped with a direct current motor coupled directly to the drum shaft, and it receives power from a fly-wheel set. In this installation it was desirable to have the hoist available for material and supplies at night with very infrequent service. In order to take care of this service, the hoist is furnished with an auxiliary induction motor drive connected through suitable gear reductions. The main pinion of the auxiliary drive is arranged so that it can be thrown out of mesh by means of a hand lever when the main motor is in use. When the hoist requirements are very infrequent, the induction motor is used for operating the hoist. This arrangement permits of shutting down the fly-wheel set during such periods, thereby eliminating the constant no-load losses of the set.

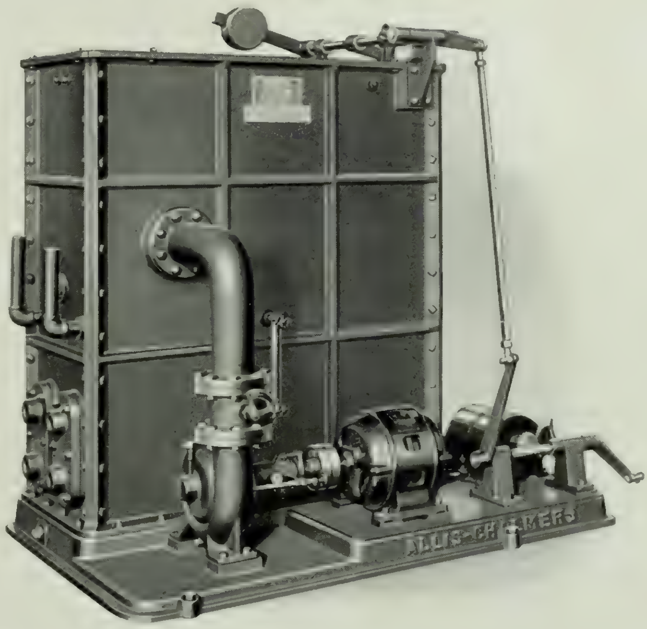
Cut No. 11106



Motor-Generator-Flywheel Set

Cut No. 15779 shows Allis-Chalmers liquid controller. This type of control is admirably adapted for hoist service. It gives absolute smooth acceleration and the electrodes are designed so that slow speeds can be obtained for taking up slack in rope or for shaft inspection purposes.

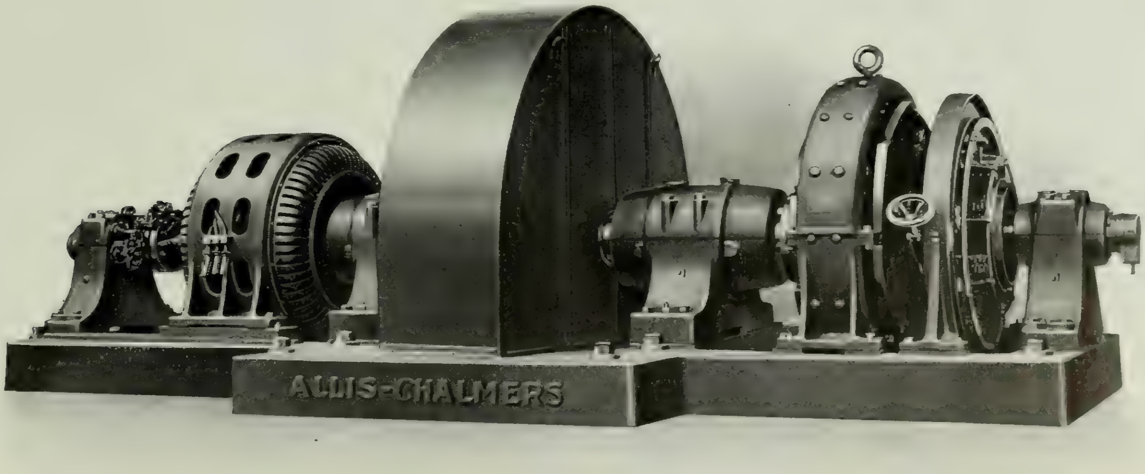
Cut No. 15779



Allis-Chalmers Liquid Controller

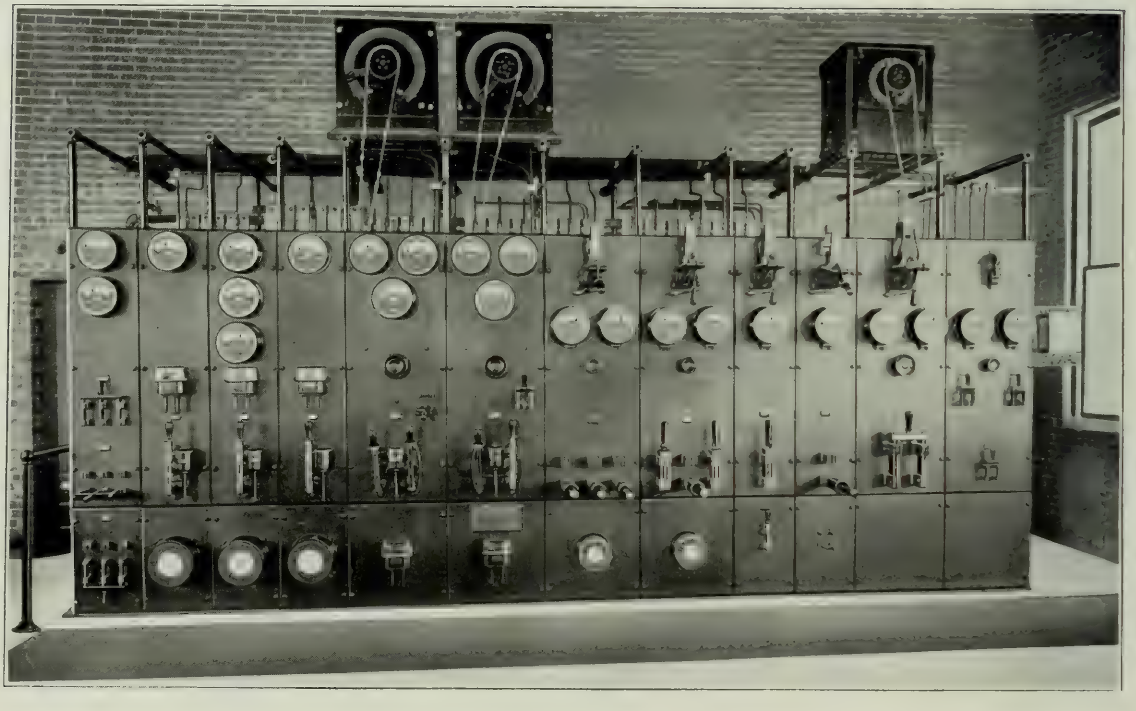
The liquid controller consists of a tank containing the electrolyte and electrodes for the control of the secondary circuit of the motor. The tank is divided into an upper and lower compartment. The lower compartment is a storage and cooling tank for the electrolyte. In the upper compartment the electrodes are suspended from an insulated support. The electrolyte is constantly circulated by a centrifugal pump. The resistance in the rotor circuit and consequently the speed of the motor is governed by the height of the electrolyte in the upper compartment, which is regulated by means of a multiple shutter weir. The weir is operated by means of a hand lever. The rate of acceleration is regulated by an adjustable valve in the discharge pipe of the pump. The patented electrode construction is such that practically a short circuited secondary is obtained when the electrodes are fully immersed.

Cut No. 14790



Motor Generator Flywheel Set with Wheel Enclosed in Plate Steel Housing

Cut No. 11181



Switchboard for Peabody Coal Co.

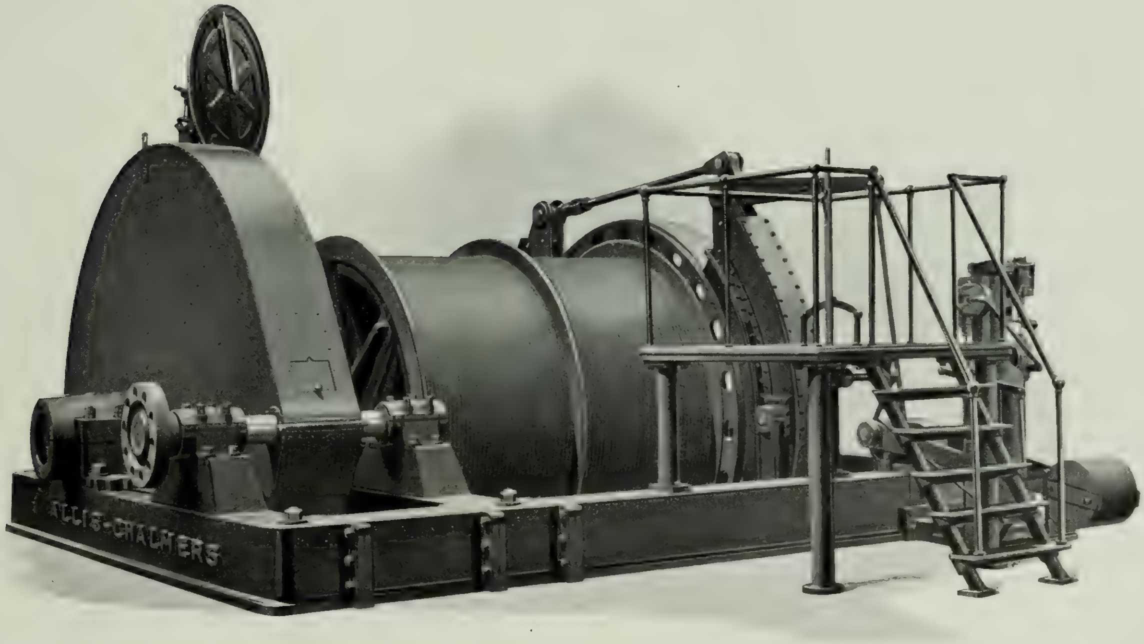
Allis-Chalmers supply complete switch-board and control equipment required in connection with hoisting machinery. Cut No. 11181 shows the switch-board furnished in connection with the installation described on page 22.

BALANCE SINGLE DRUM HOIST

BUILT FOR

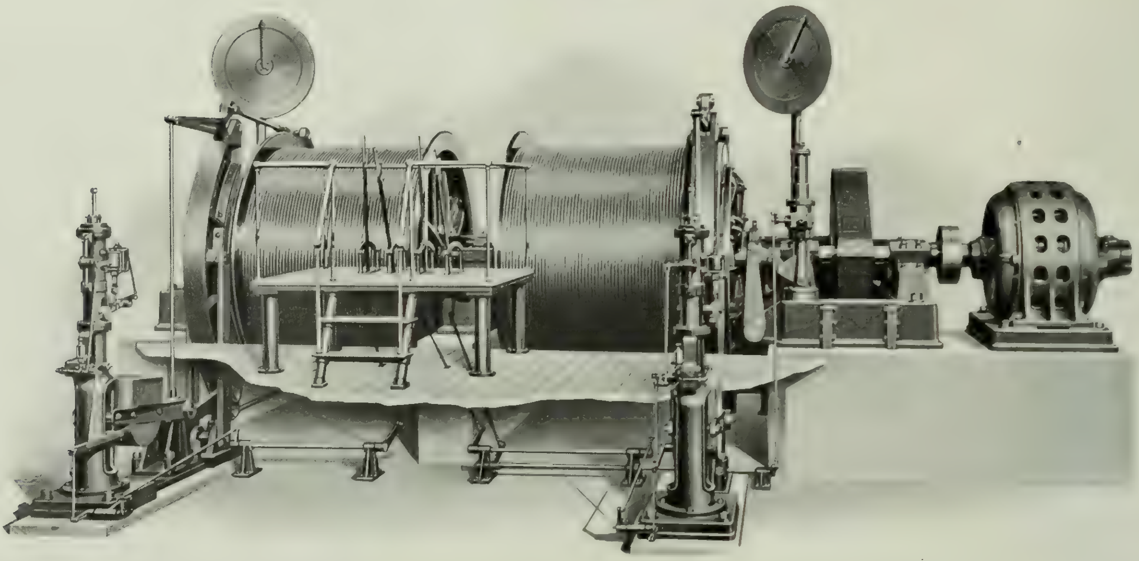
PHELPS DODGE CORPORATION

Cut No. 15260



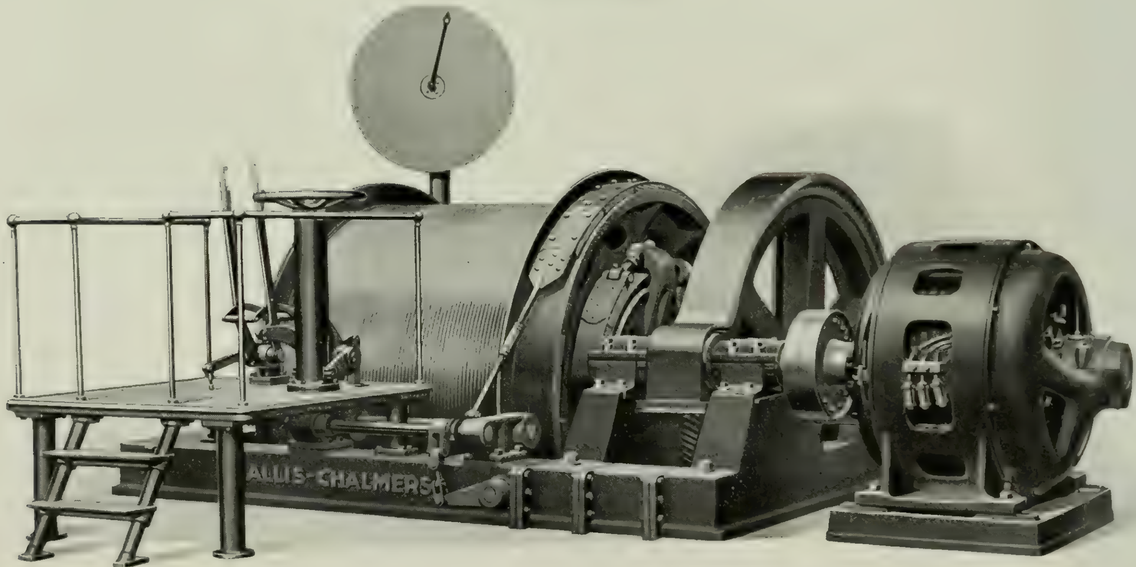
20,000 lbs. rope pull, 800 ft. per minute balanced single drum hoist. Drum supplied with a center flange. Structural steel parallel motion post brake actuated by oil operated brake engine. Single reduction Falk gears totally enclosed. Oil pressure system. Complete safety protection

Cut No. 14394



BUILT FOR TENNESSEE COAL, IRON & RAILROAD COMPANY
10,000 lbs. rope pull, 1,800 ft. per minute rope speed double drum hoist. Parallel motion post brakes air engine operated. One drum keyed to shaft and one driven by multiple arm disc clutch air engine operated. Complete safety protection. Hoist complete with a 350 H. P., 2,200 volt, 25 cycle, 3 phase induction and liquid controller

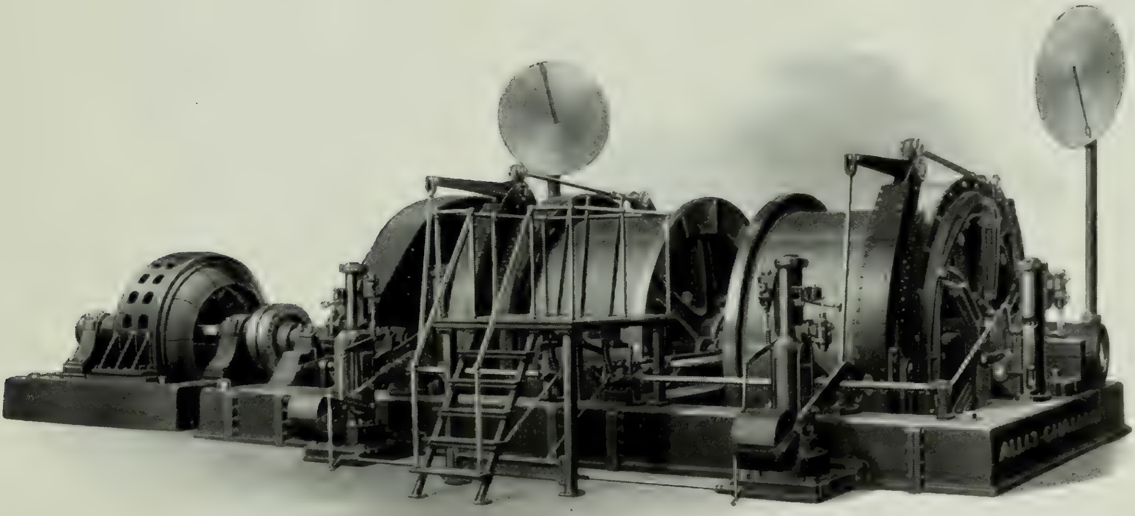
Cut No. 14270



BUILT FOR UNION PACIFIC COAL COMPANY
8,200 lbs. rope pull, 1,600 ft. per minute rope speed single drum slope hoist. Hand operated band brake and Lane clutch. Single reduction Falk gears. Hoist driven by 400 H. P., 2,200 volt, 60 cycle, 3 phase induction motor. Control equipment liquid type.

DOUBLE DRUM HOIST

Cut No. 13249



34,000 lbs. rope pull, 1,000 ft. per minute rope speed double drum hoist. Structural steel parallel motion post brakes. Multiple arm double disc clutches. Brakes and clutches operated by oil engines with a single hand lever for operating the brake and clutch engines for each drum. Single reduction Falk gears. Complete safety devices. Hoist driven by 1,000 H. P., 2,200 volt, 60 cycle, 3 phase motor and complete with liquid controller

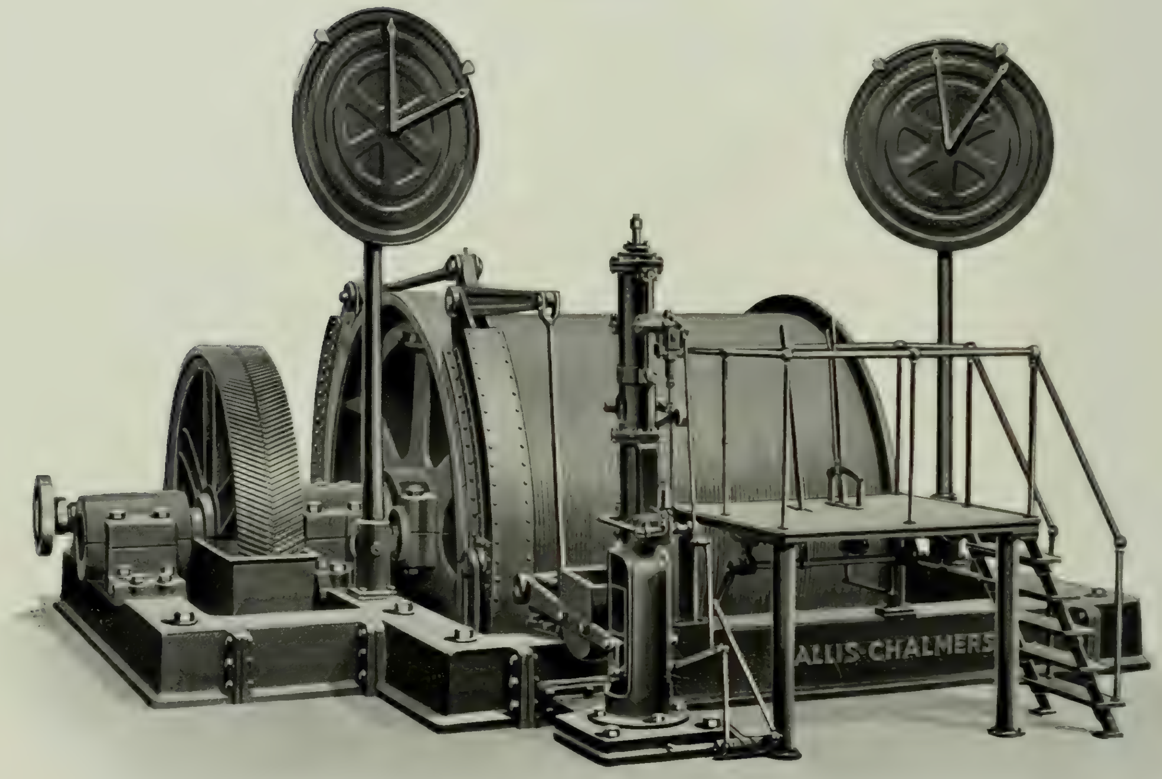
BALANCED SINGLE DRUM HOIST

TWO EQUIPMENTS

BUILT FOR

OLIVER IRON MINING COMPANY

Cut No. 16177



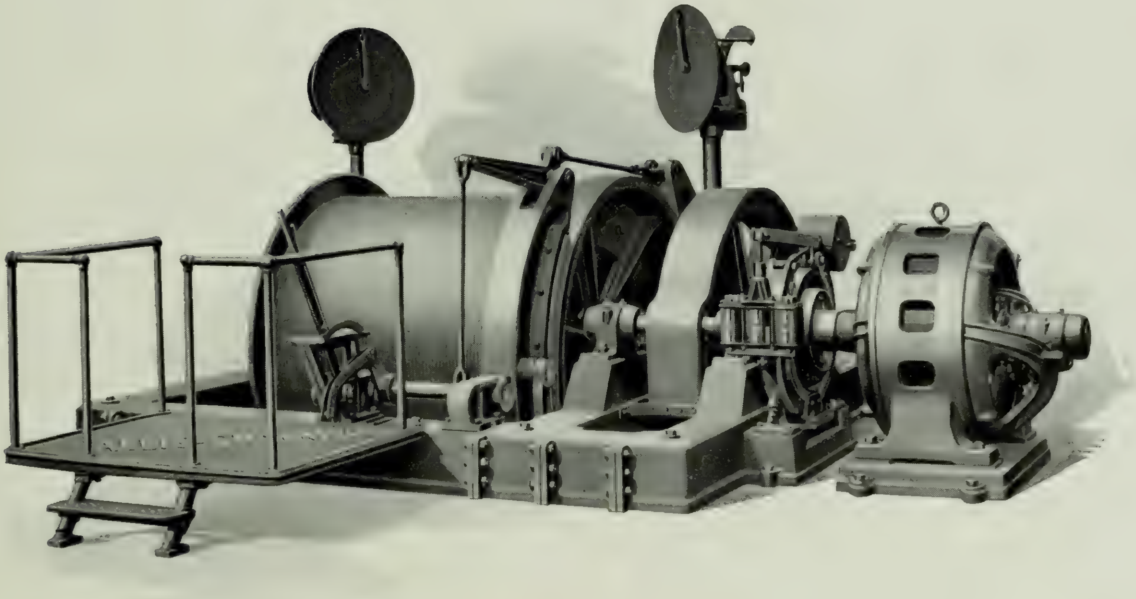
12,350 lbs. rope pull, 1,000 ft. per minute rope speed balanced single drum hoist. Structural steel parallel motion post brake, air engine operated. Single reduction Falk gears totally enclosed. Complete safety features

BALANCED SINGLE DRUM HOIST

BUILT FOR

NORTHERN ORE COMPANY

Cut No. 13631



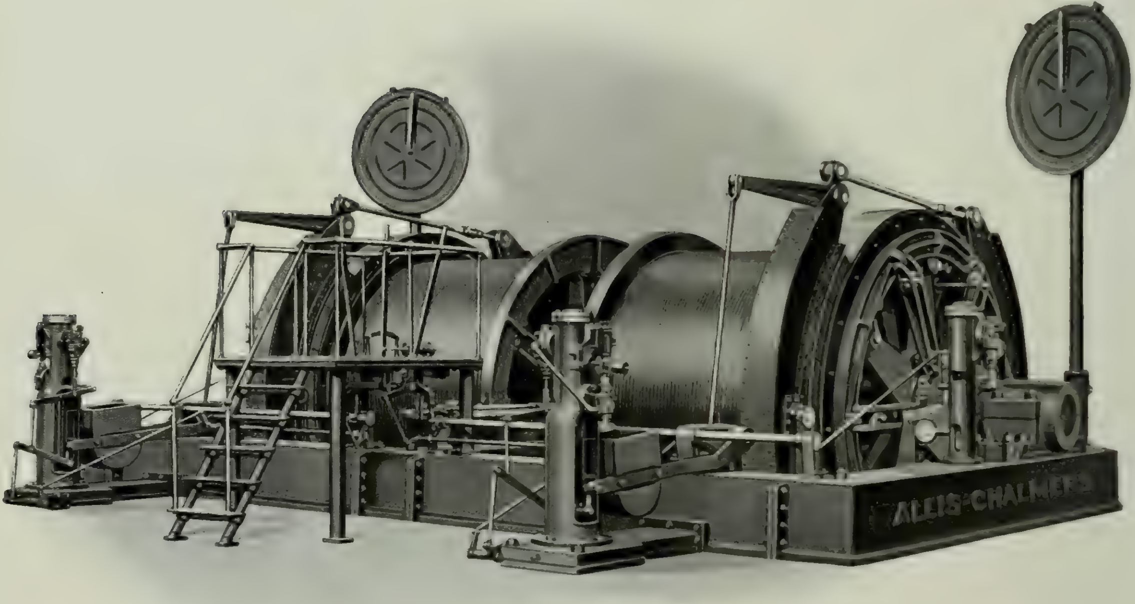
9,000 lbs. rope pull, 1,000 ft. per minute rope speed balanced single drum hoist. Equipped with hand operated parallel motion post brake on drum and solenoid operated post brake on pinion shaft. Single reduction Falk gears. Complete safety features. Hoist driven by 125 H. P., 2,200 volt, 60 cycle, 3 phase induction motor. Magnetic control equipment

DOUBLE DRUM ELECTRIC HOIST

BUILT FOR

HOMESTAKE MINING COMPANY

Cut No. 16028



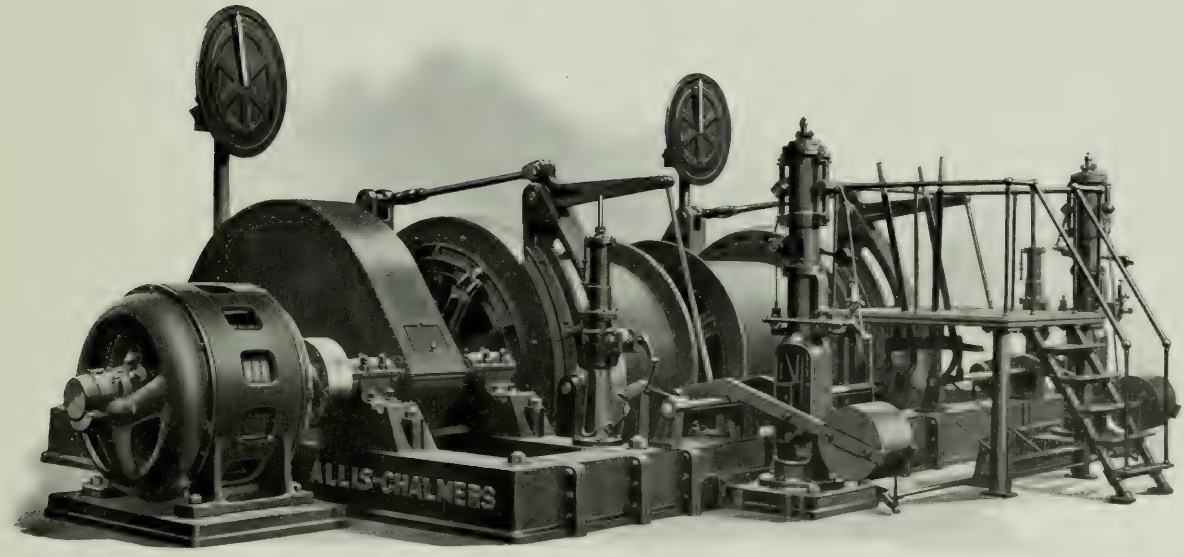
36,300 lbs. rope pull, 2,000 ft. per minute rope speed. Motor direct connected to the drum shaft. Drum shells are made of rolled steel plate and the drum end flanges of cast steel. Each drum is served by a powerful parallel motion post brake of the structural steel design. Each drum is driven by a multiple arm double disc friction clutch. Both brakes and clutches are operated by oil engines. The brake and clutch engine for each drum are operated by a single hand lever. An acceleration and slow-down device and a retardation cylinder are provided with the controller lever to prevent possible damage to the hoist or electrical equipment. Hoist is also supplied with protection against overwinding and overspeeding.

DOUBLE DRUM ELECTRIC HOIST

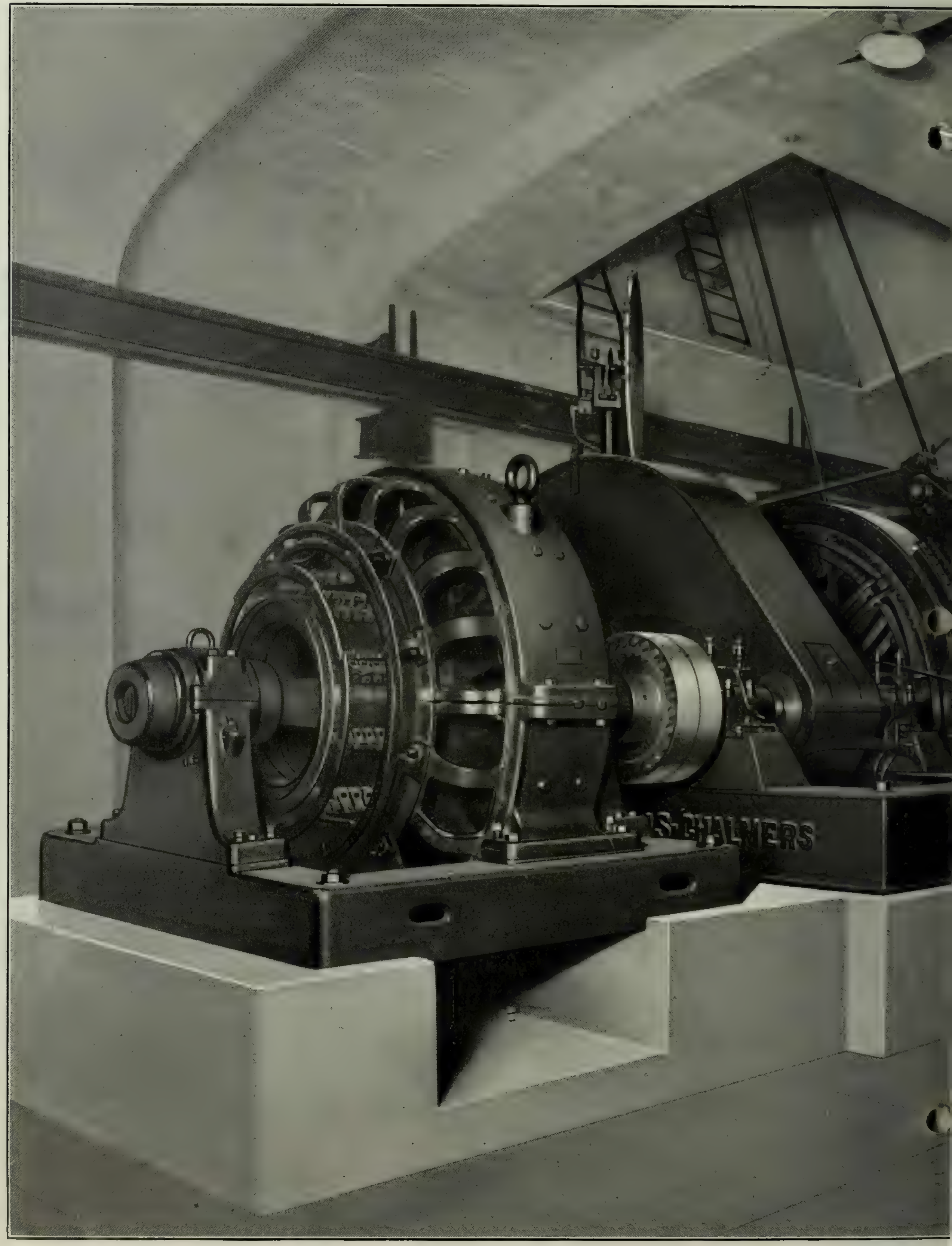
BUILT FOR

IRON CAP COPPER COMPANY

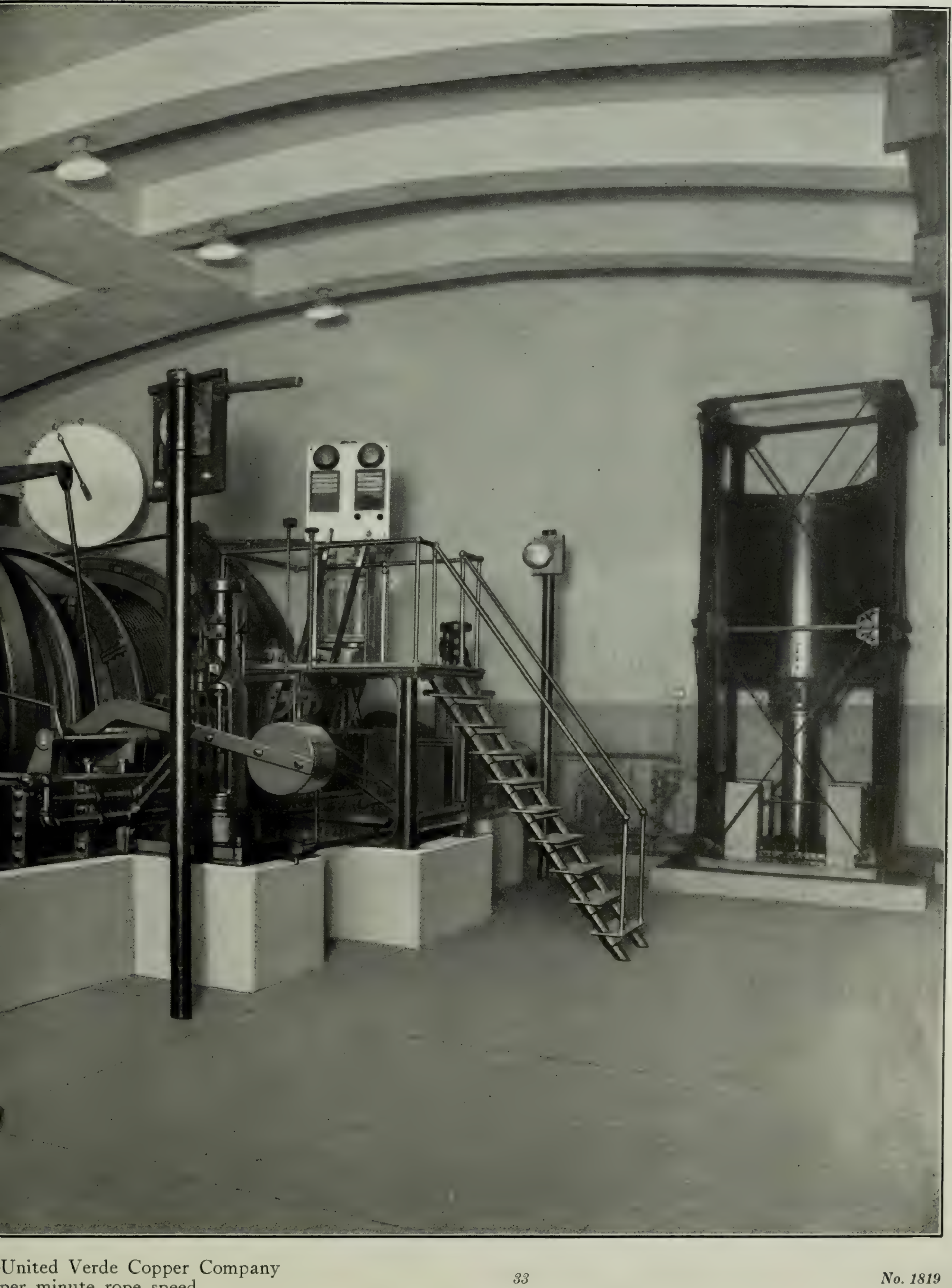
Cut No. 15264



15,000 lbs. maximum rope pull, 700 ft. per minute rope speed. Parallel motion post brakes. multiple arm double disc clutches. Brake and clutch engines air operated. Single reduction Falk gears. Dial indicators and complete safety devices, all gear driven. Hoist complete with 250 H. P., 2,200 volt, 60 cycle, 3 phase induction motor and liquid controller



1000 Foot Underground Hoist S
33,500 lbs. rope pull—1



United Verde Copper Company
per minute rope speed.

CYLINDRO CONICAL DRUM HOIST

FOR

COAL MINES

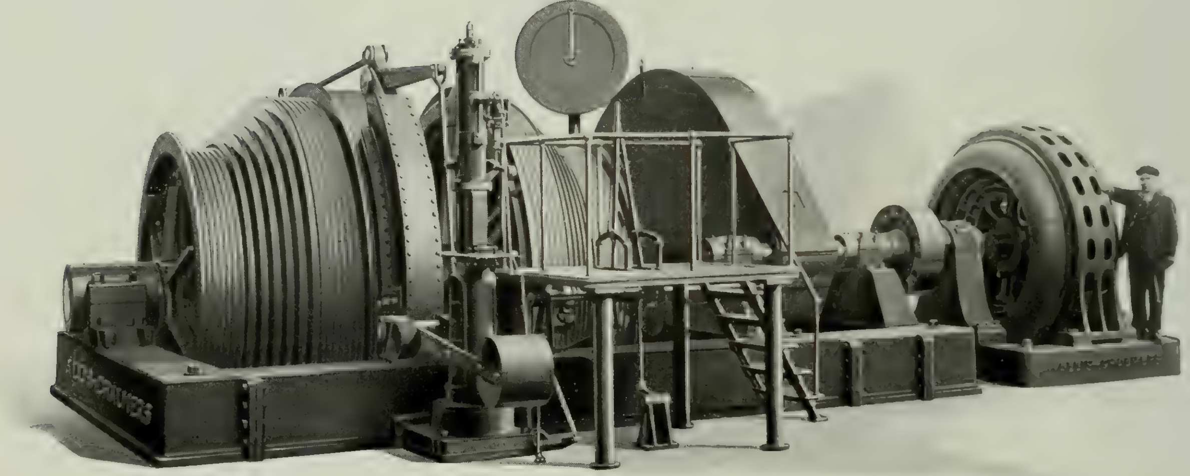
DRIVEN BY

900 H. P., 2200 V., 60 CY., 3 PH., INDUCTION MOTOR
LIQUID TYPE CONTROLLER

BUILT FOR

STANDARD OIL COMPANY

Cut No. 14080



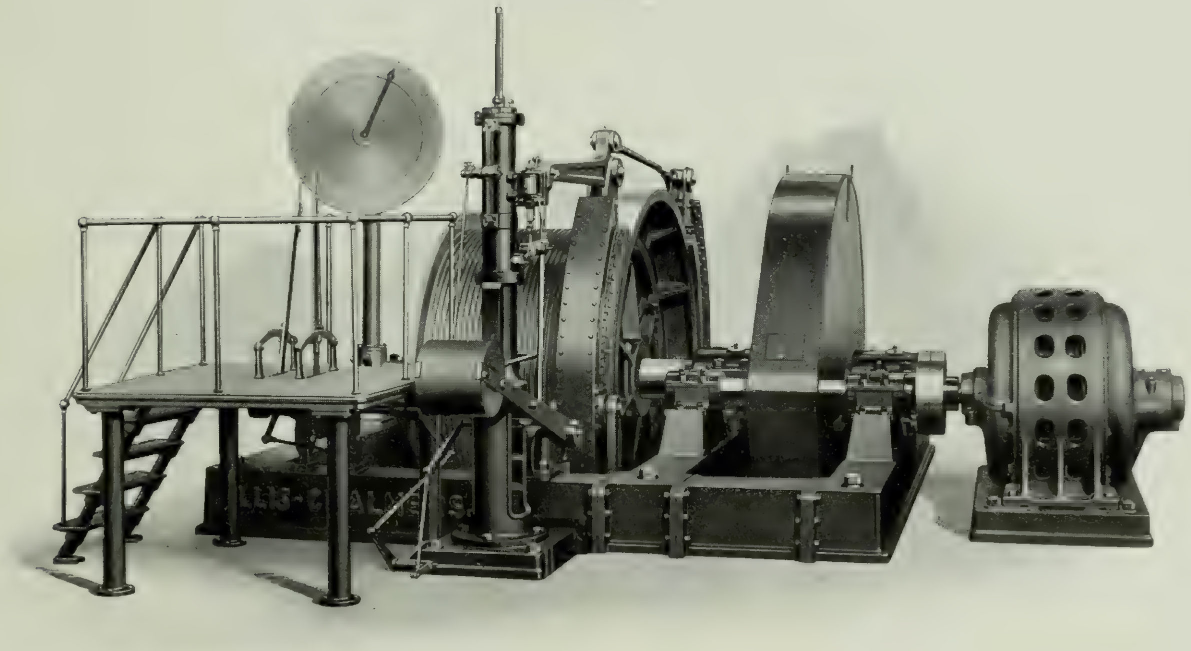
46,000 lbs. rope pull, 900 ft. per minute average rope speed. Powerful parallel motion structural steel post brake air engine operated. Single reduction Falk gears. Allis-Chalmers flexible coupling. Hoist is supplied with latest safety devices

BALANCED SINGLE DRUM HOIST

BUILT FOR

STANDARD OIL COMPANY

Cut No. 14269



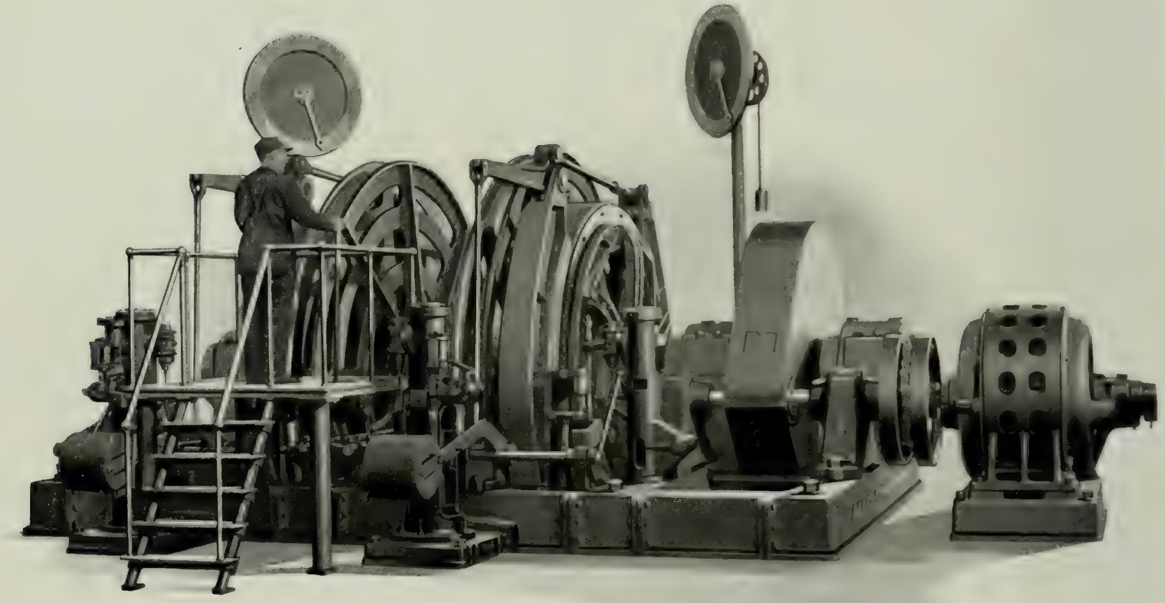
28,150 lbs. rope pull, 600 ft. per minute rope speed balanced single drum supply hoist. Structural steel parallel motion post brake, air engine operated. Single reduction Falk gears. Complete safety devices. Hoist complete with 250 H. P., 2,200 volt, 60 cycle, 3 phase induction motor and liquid controller

DOUBLE REEL HOIST

BUILT FOR

DALY JUDGE MINING CO.

Cut No. 12564



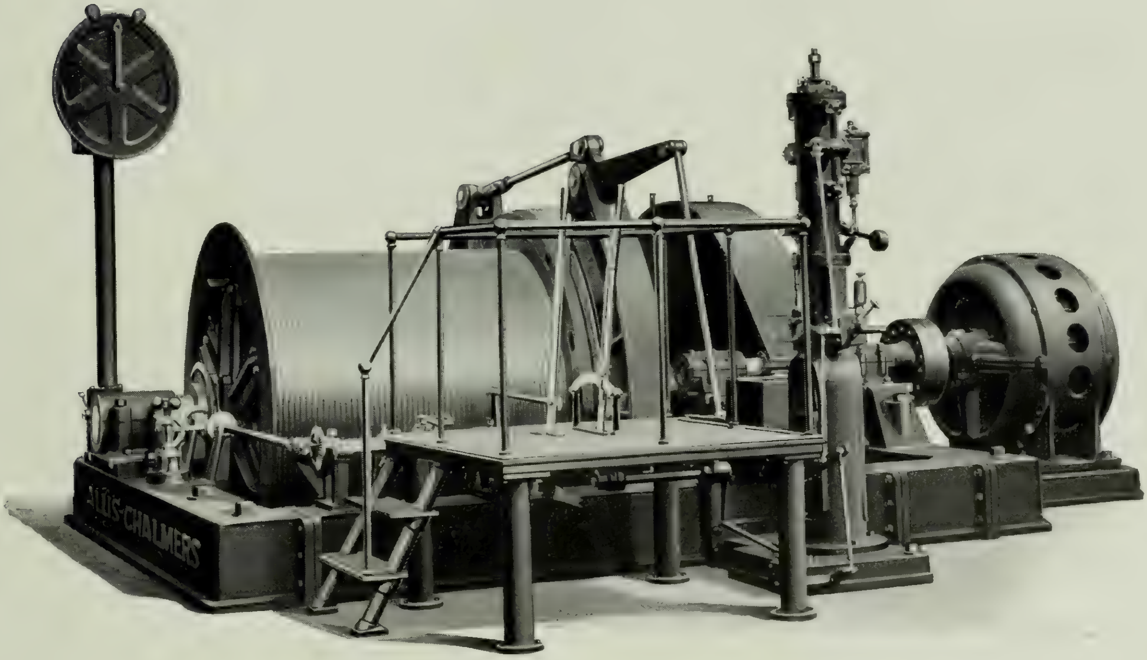
20,100 lbs. rope pull, 2,260 ft. per minute maximum rope speed double reel hoist with parallel motion post brakes, multiple arm double disc clutches. Oil brake and clutch engines. Single reduction Falk gears. Hoist complete with 400 H. P., 440 volt, 60 cycle, 3 phase induction motor and liquid controller.

BALANCED SINGLE DRUM ELECTRIC HOIST

BUILT FOR

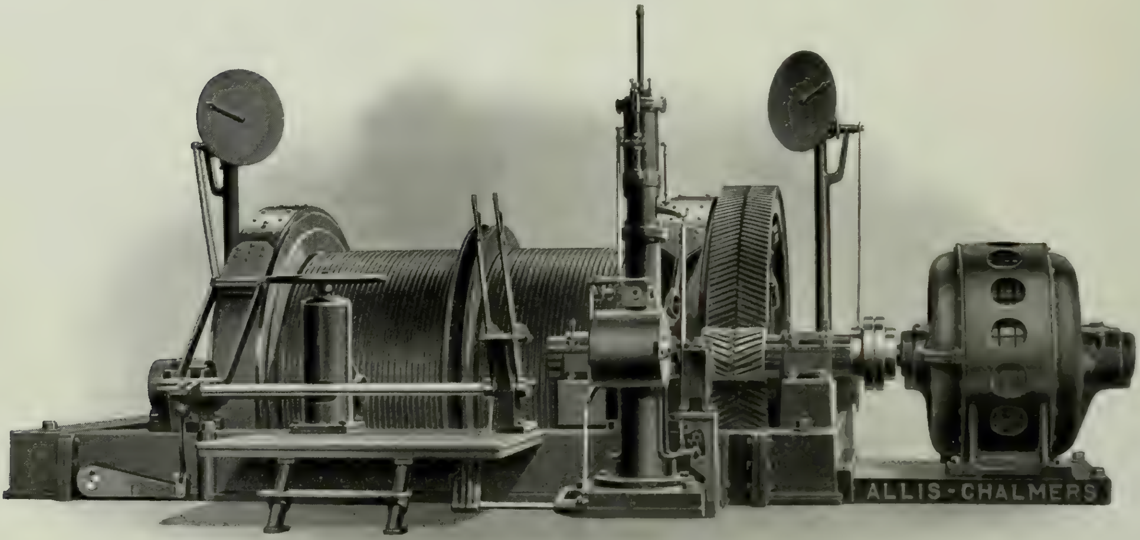
JEFFERSON ISLAND SALT COMPANY

Cut No. 16078



17,200 lbs. rope pull, 700 ft. per minute rope speed. One rope winds on as the other unwinds. Hoist equipped with a parallel motion post brake, air engine operated. Single reduction Falk gears. Dial indicator and complete safety devices all gear driven from the drum hub. Hoist complete with 250 H. P., 440 volt, 60 cycle, 3 phase induction motor and liquid controller

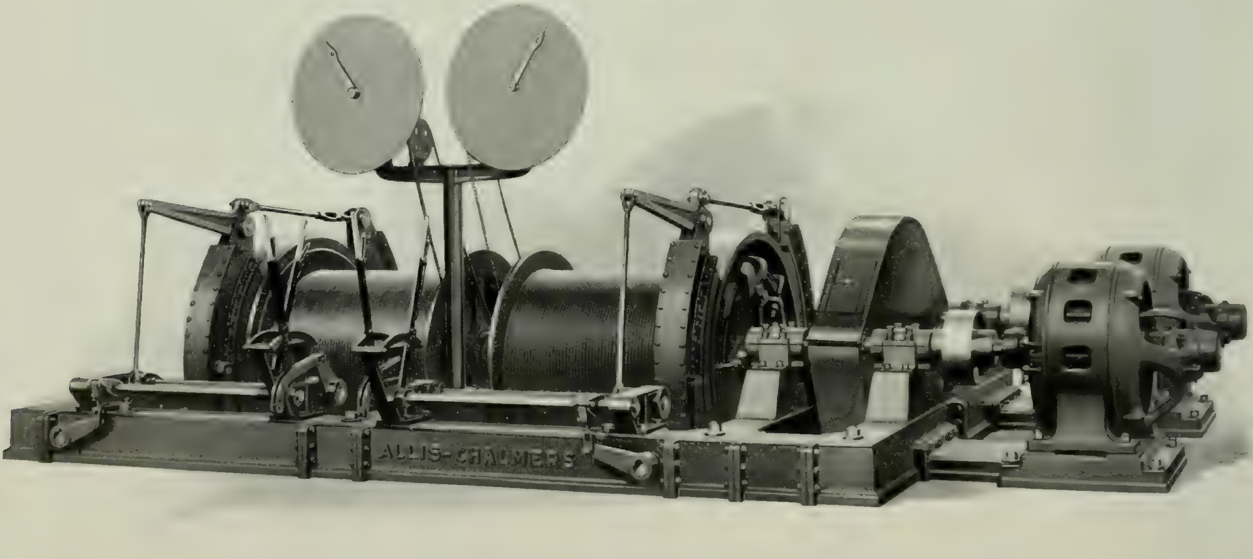
Cut No. 11182



BUILT FOR DAVIS COAL & COKE COMPANY

17,000 lbs. rope pull, 1,700 ft. per minute rope speed, double drum hoist without center bearing. One drum keyed and one loose on the shaft and driven by a multiple tooth clutch. Air operated Brake Engine. Single reduction Falk gears. Complete safety features. Hoist is driven by 600 H. P., 550 volt, 60 cycle, 3 phase, 695 R. P. M. continuous duty induction motor. Controller liquid type.

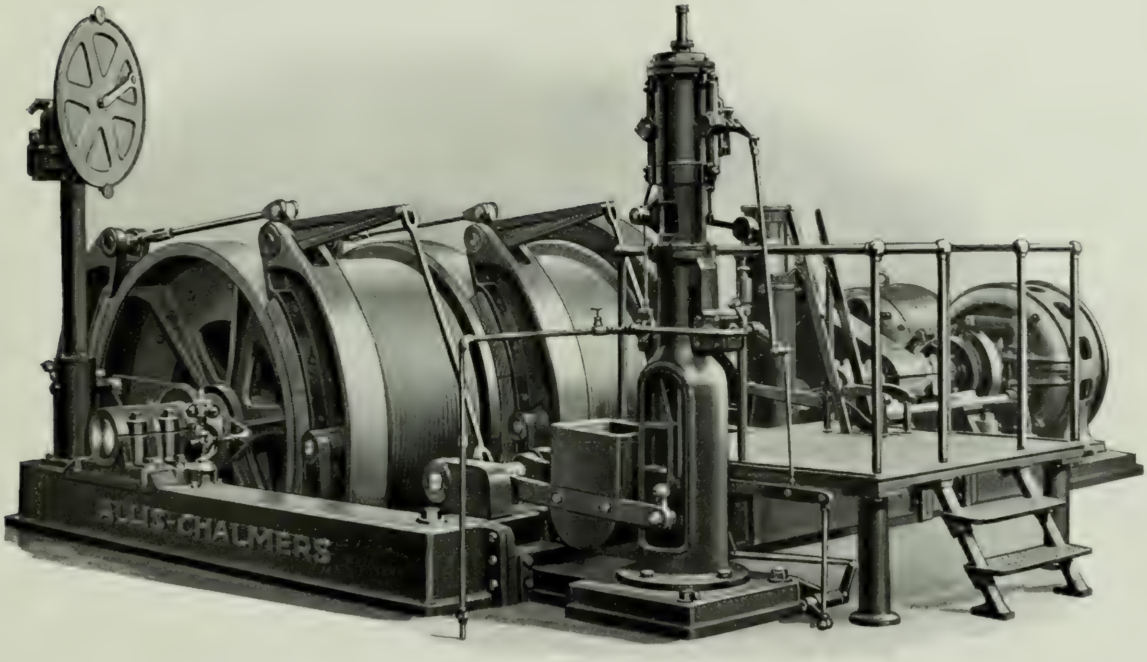
Cut No. 14142



BUILT FOR KENNECOTT COPPER CORPORATION, ALASKA

10,000 lbs. rope pull, 600 ft. per minute rope speed, double drum hoist equipped with hand operated parallel motion post brakes and Lane clutches. Single reduction Falk gears. Two 85 H. P., 440 volt, 60 cycle, 3 phase, 575 R. P. M. motors with magnetic controller. Hoist, motors and controller sectionalized for aerial tramway transportation

Cut No. 15717



BUILT FOR SOLVAY COLLERIES COMPANY

17,500 lbs. rope pull, 600 ft. per minute rope speed, Balanced Single Drum Hoist

Drum equipped with two parallel motion Post Brakes.

One of these brakes is operated by means of a hand lever, the other is controlled by an air operated brake engine.

An auxiliary post brake is supplied on the pinion shaft.

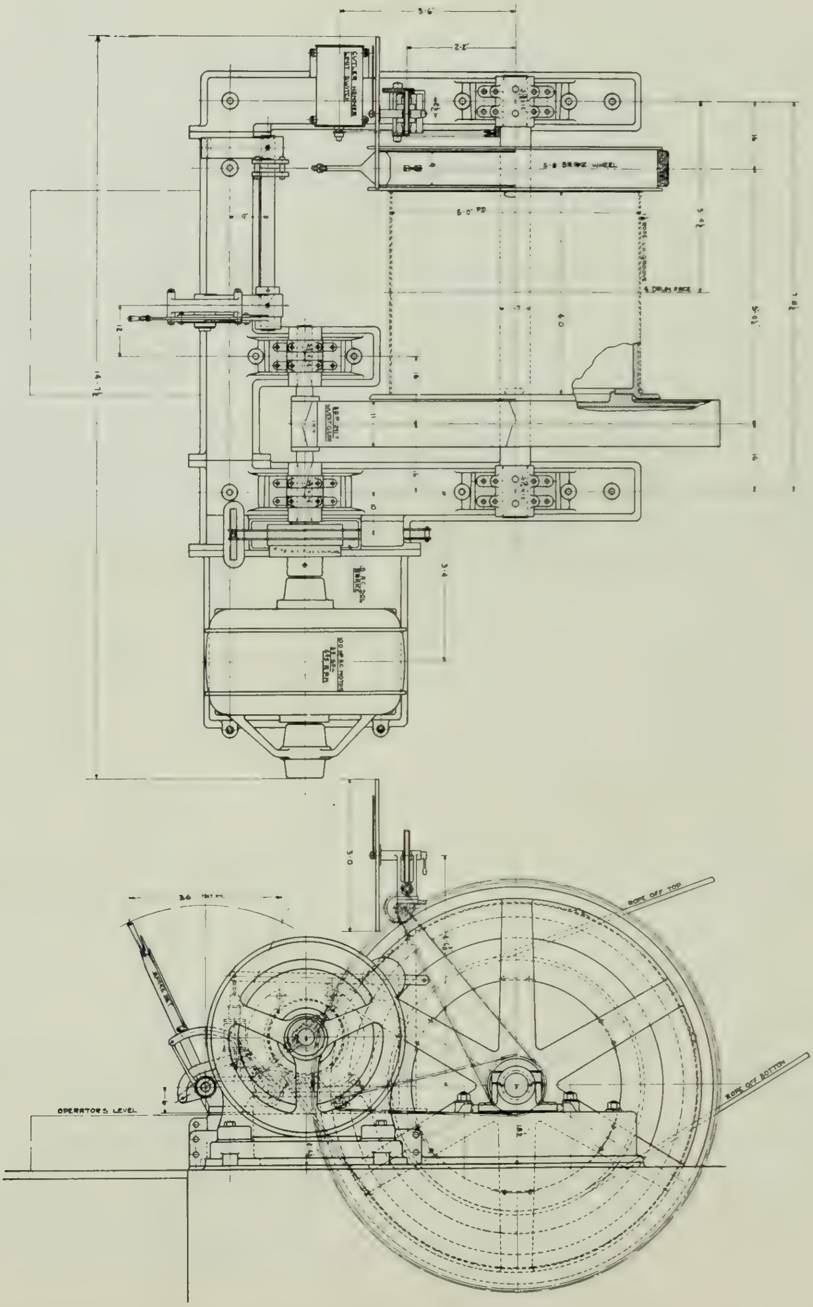
Safety protection is provided for every contingency.

The hoist is fitted with an instrument to record all trips, signals and delays.

The hoist will handle men and is built with an alternating current and a direct current motor which receive current from separate power sources so that the hoist will be ready for service at all times. Change from alternating current to direct current operation can be made in a few minutes. The safety features protect the hoist if either the alternating current or direct current motor is being used.

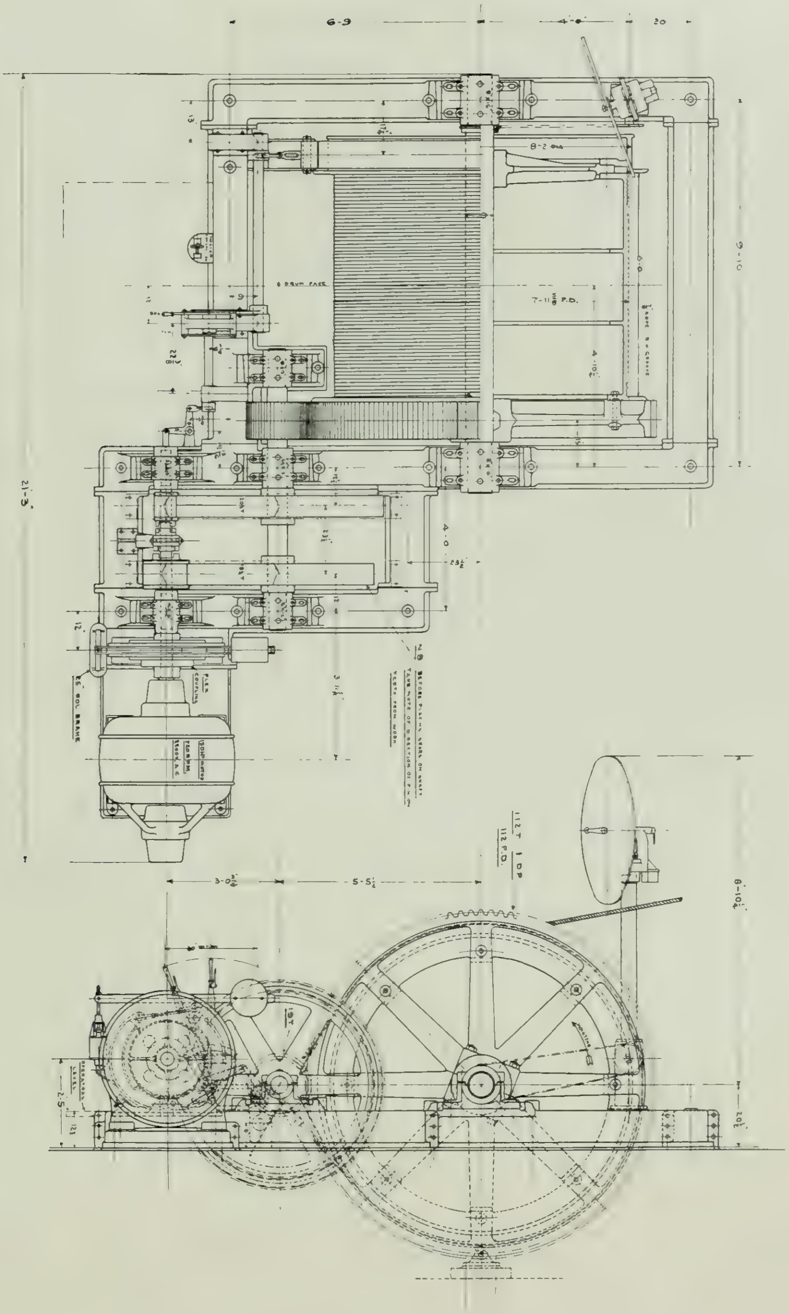
On the following pages are reproduced general drawings of typical hoists which will give an idea of the design and approximate floor space required. It is hoped that they may be useful in working up preliminary data or estimates.

Cut No. 16173



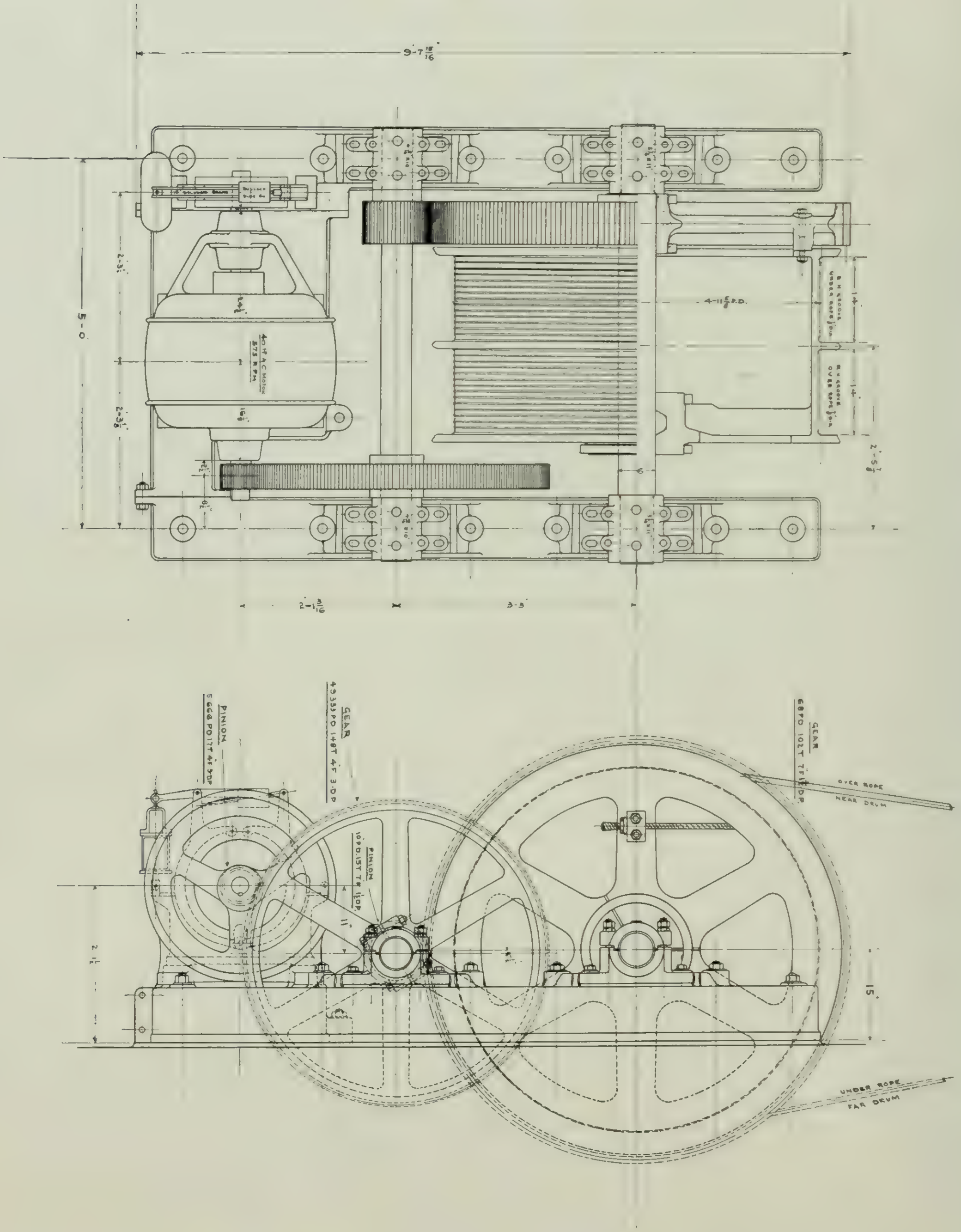
9600 lbs. rope pull 455 ft. per minute rope speed

Cut No. 16175



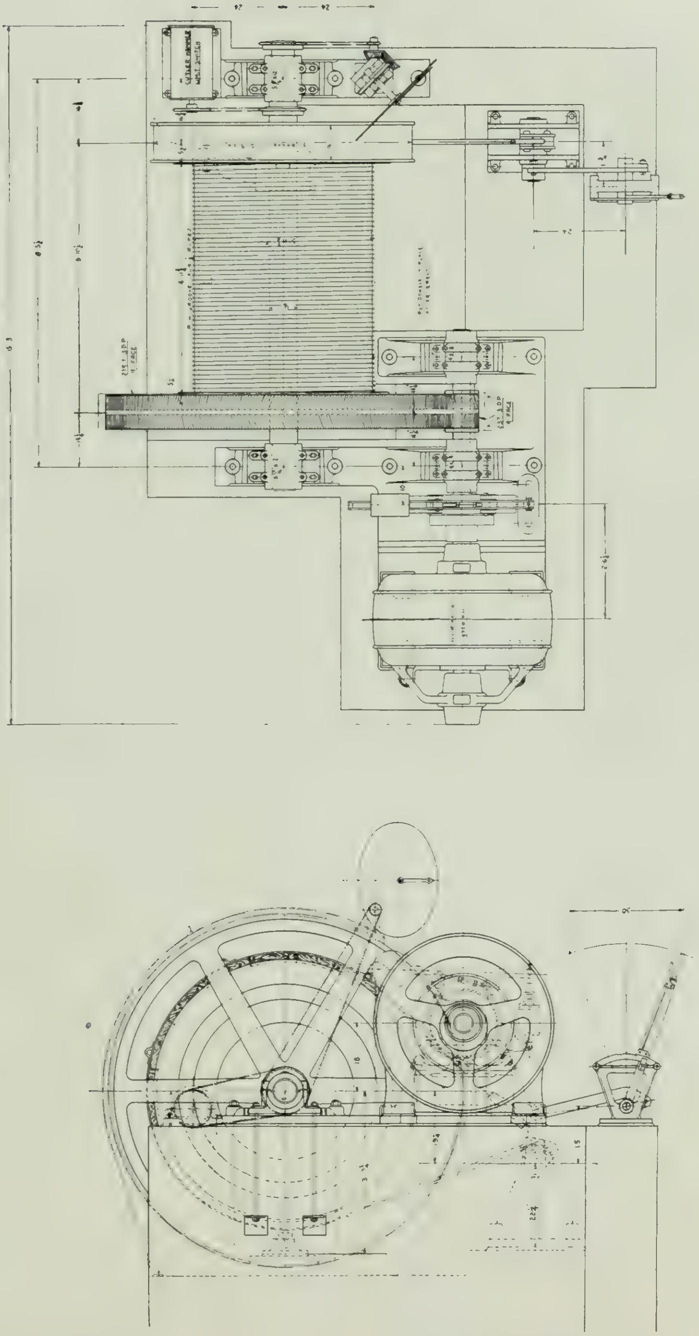
13,800 lbs. rope pull, 350 and 700 ft. per minute rope speed

Cut No. 16171



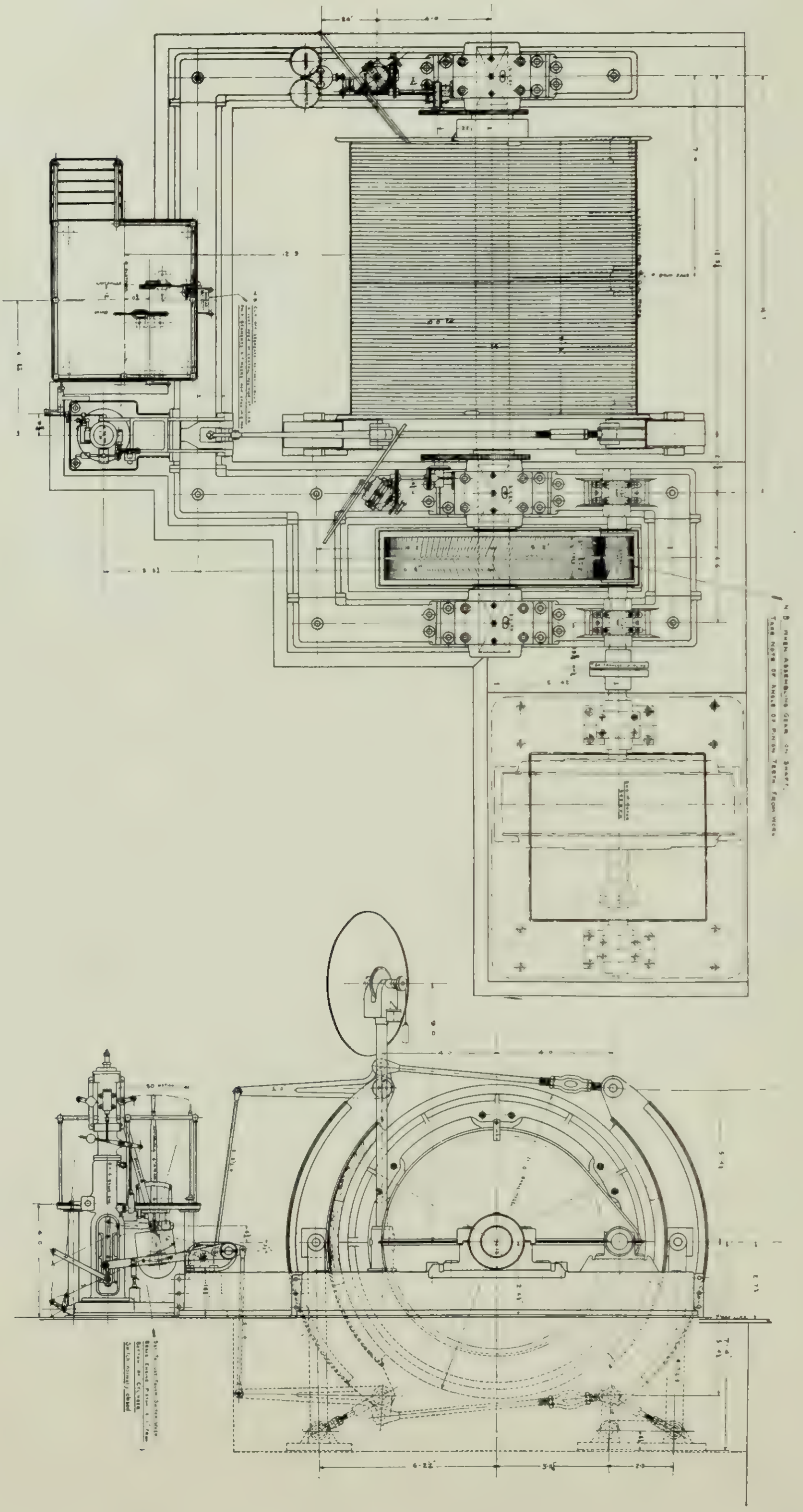
8,300 lbs. rope pull, 150 ft. per minute rope speed

Cut No. 16172



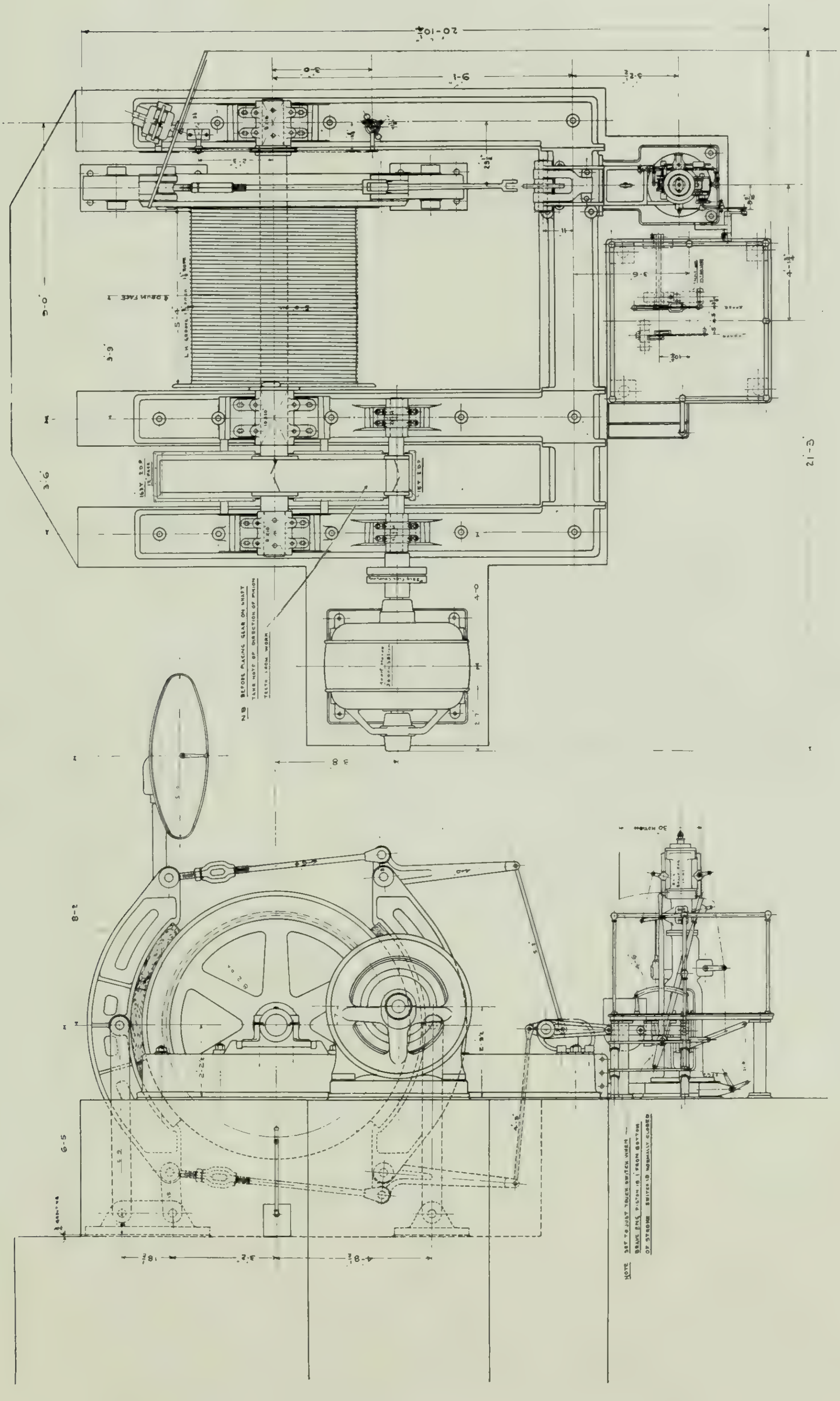
8,200 lbs. rope pull, 455 ft. per minute rope speed

Cut No. 16168



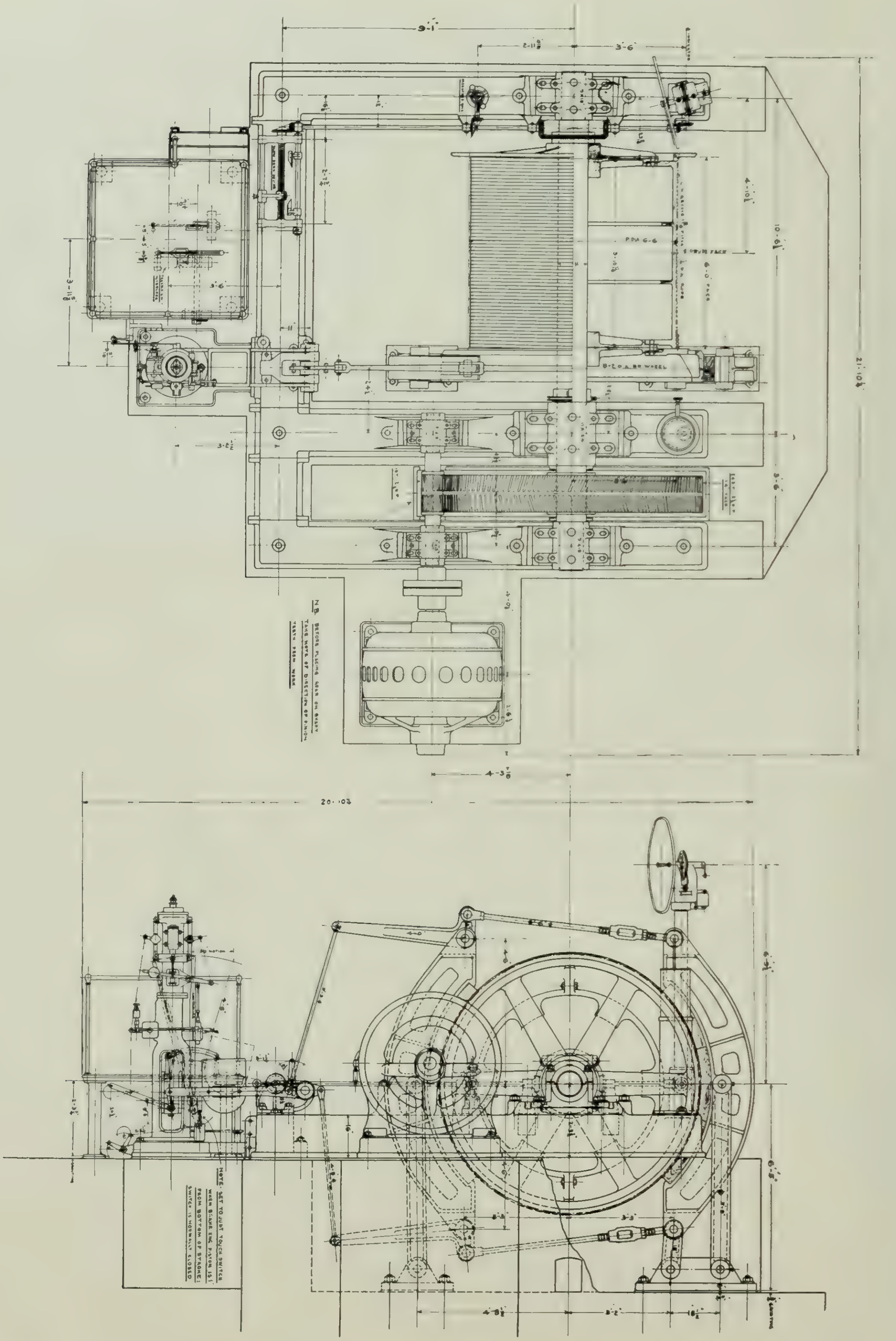
15,970 lbs. rope pull, 1,500 ft. per minute rope speed

Cut No. 16163



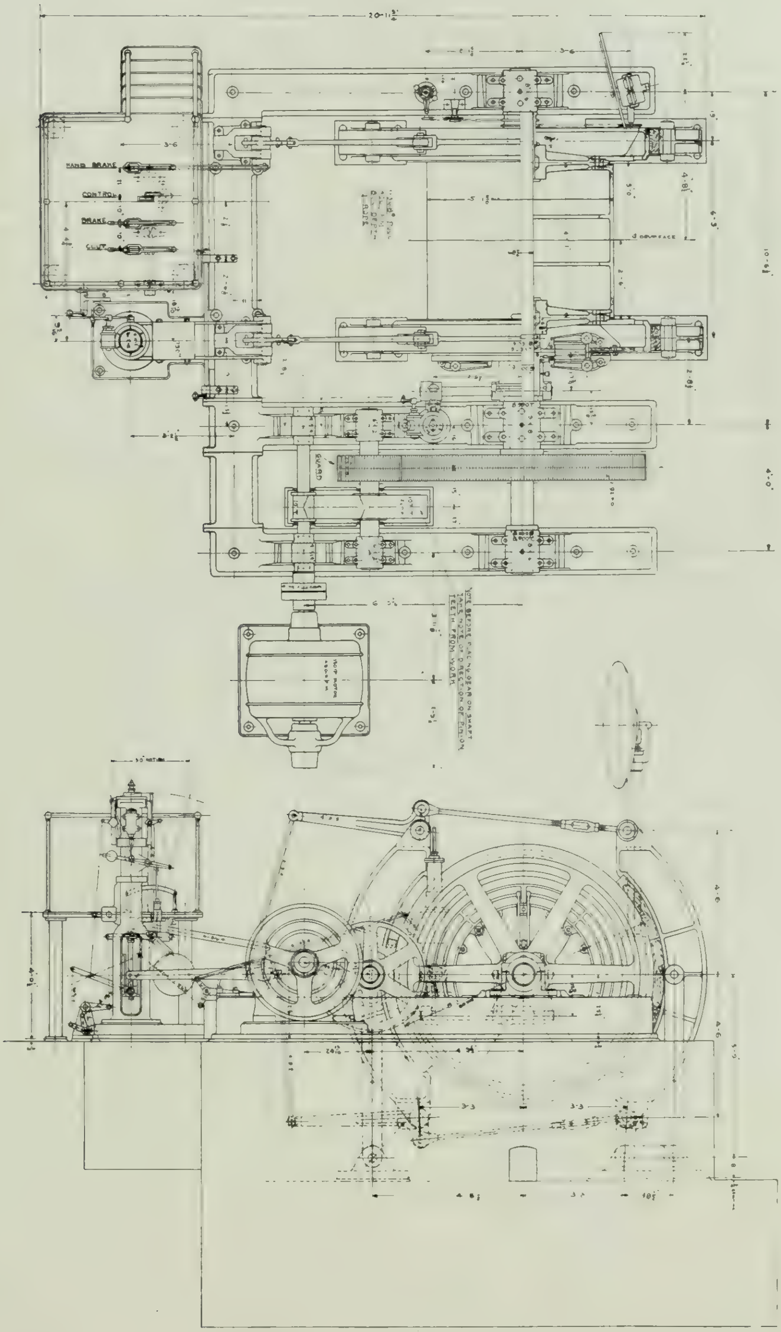
17,400 lbs. rope pull, 850 ft. per minute rope speed

Cut No. 16167


9-1
2-11
3-6
21-10
10-0
3-6
4-3
20-10
6-0 FACE
N.B. BEFORE PLACING GEAR ON SHAFT
TAKE NOTE OF DIRECTION OF PINION
TEETH FROM WORM
NOTE. SET TO JUST TOUCH SWITCH
WHEN BRAKE ENG. PISTON IS 1"
FROM BOTTOM OF STROKE;
SWITCH IS NORMALLY CLOSED

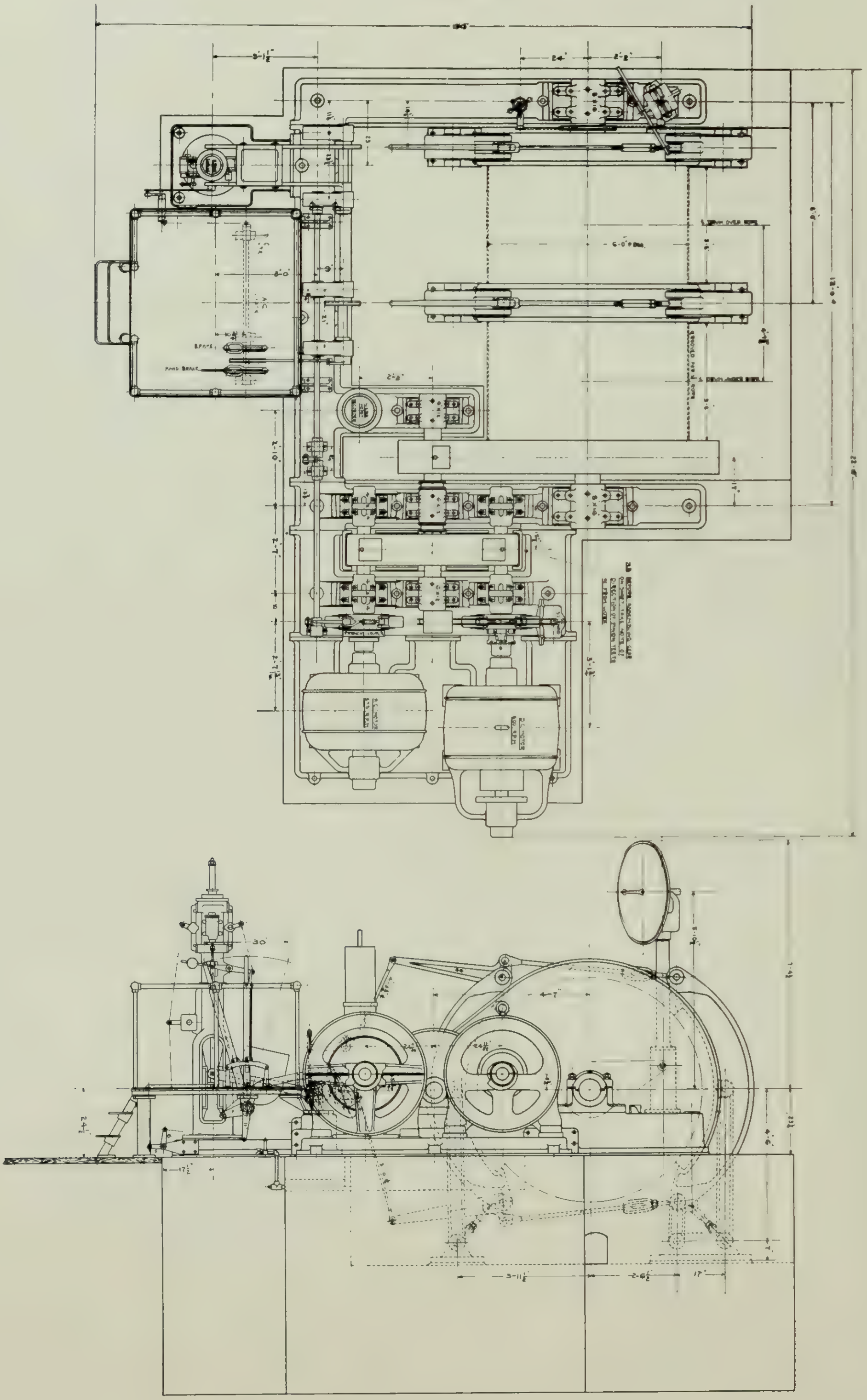
17,200 lbs. rope pull, 700 ft. per minute rope speed

Cut No. 16174



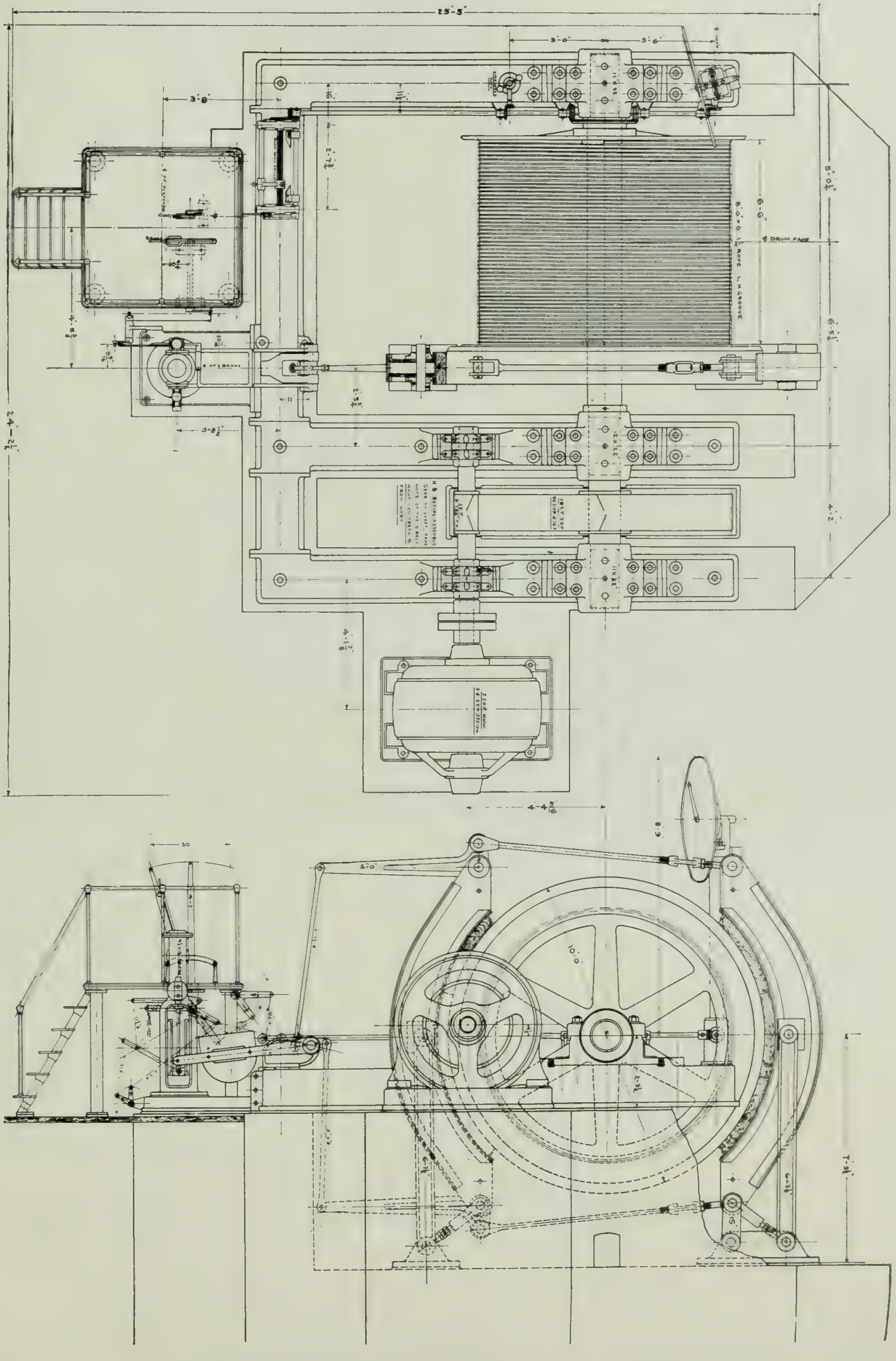
11,368 lbs. rope pull, 400 ft. per minute rope speed

Cut No. 16164



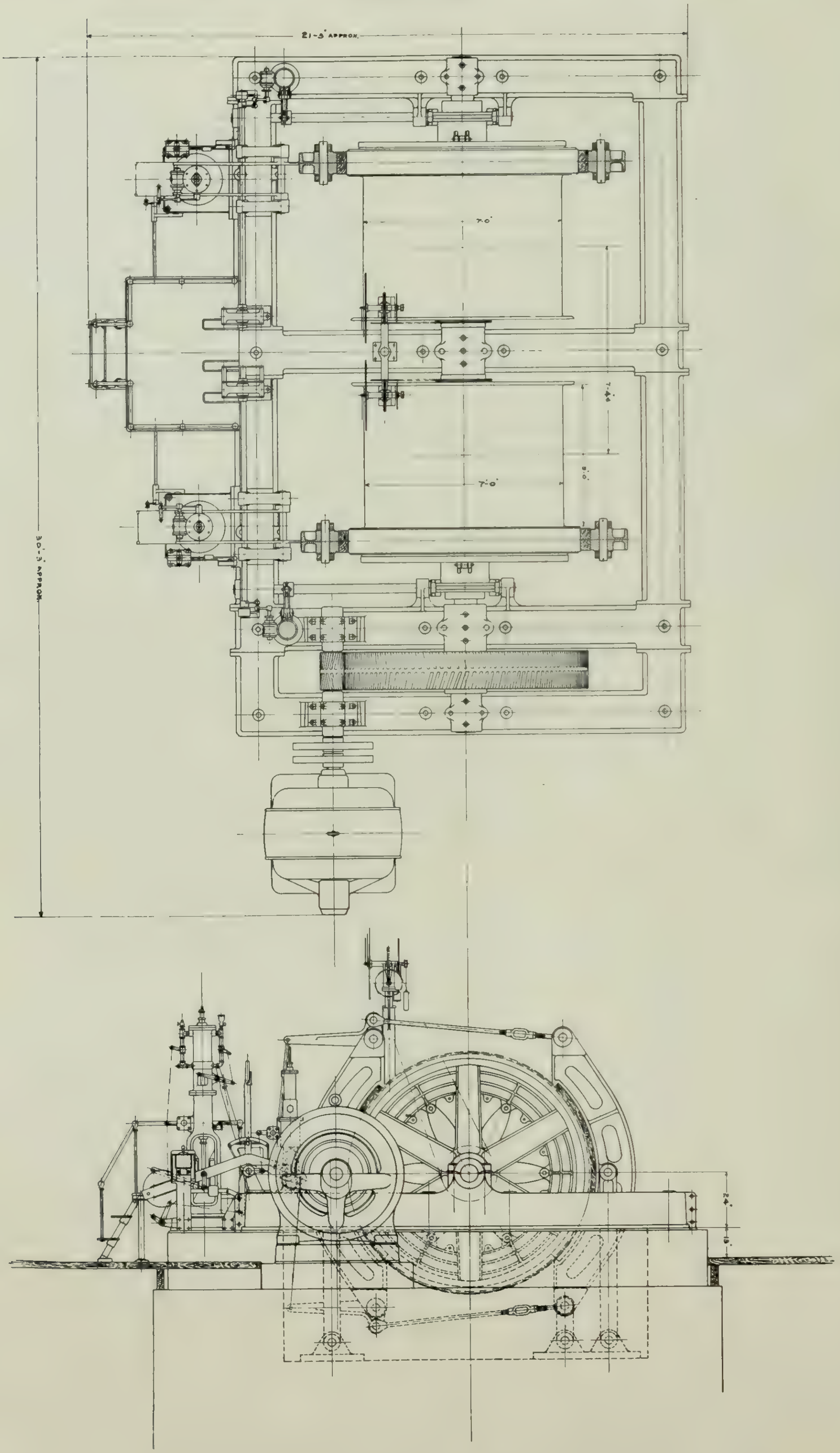
11,150 lbs. rope pull, 600 ft. per minute rope speed

Cut No. 16166



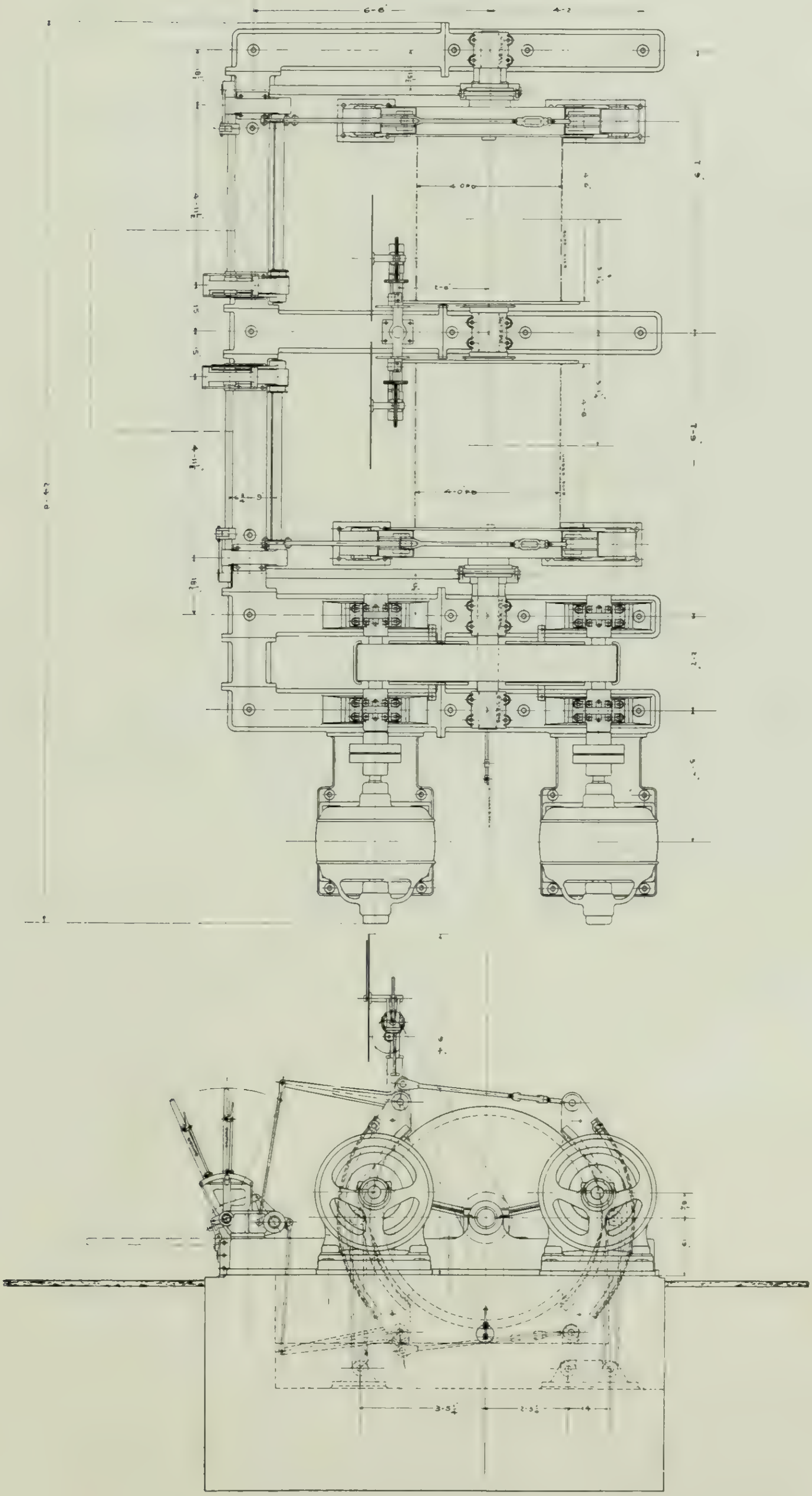
23,000 lbs. rope pull, 800 ft. per minute rope speed

Cut No. 11034



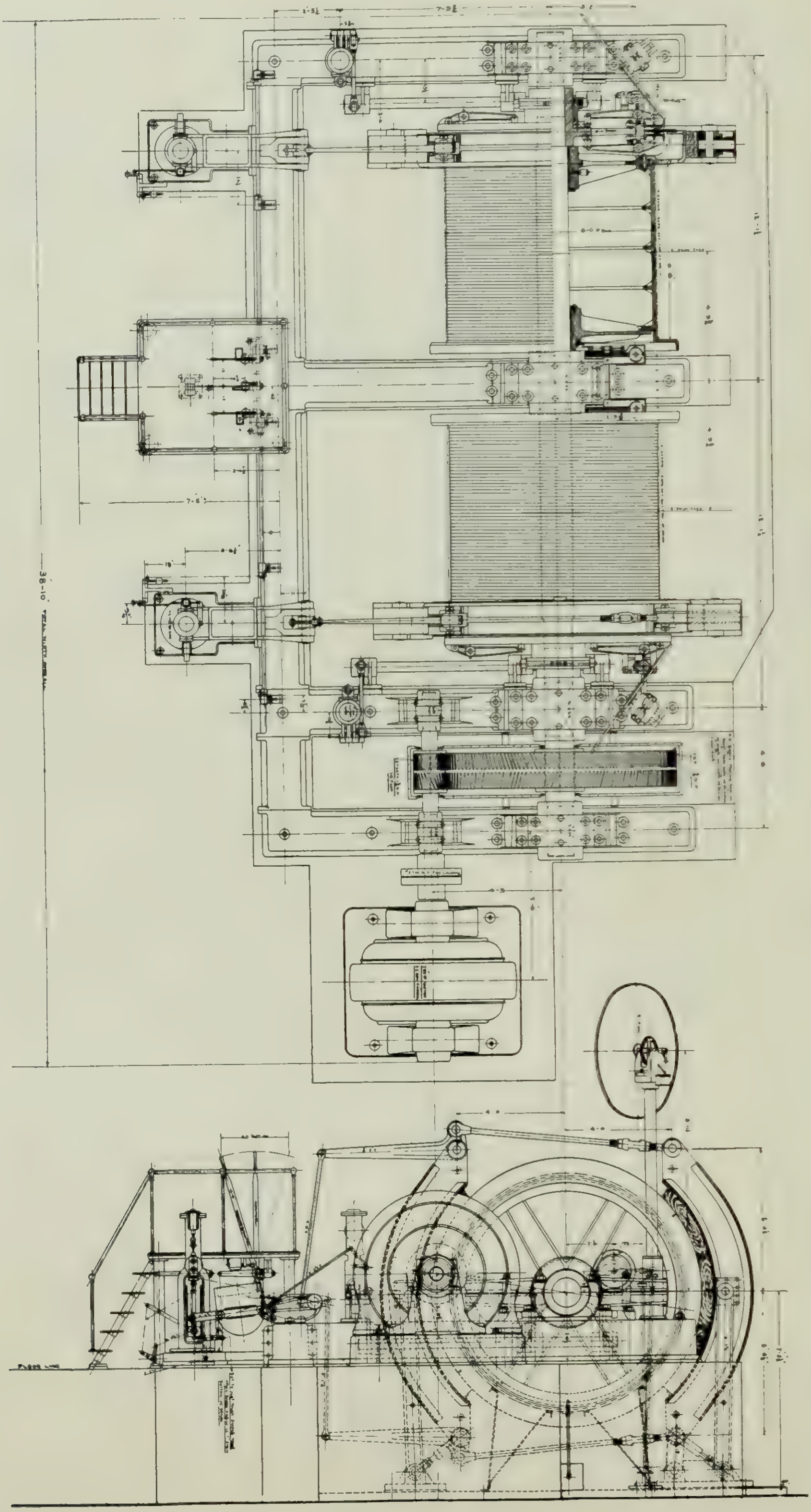
15,000 lbs. rope pull, 700 ft. per minute rope speed

Cut No. 16165



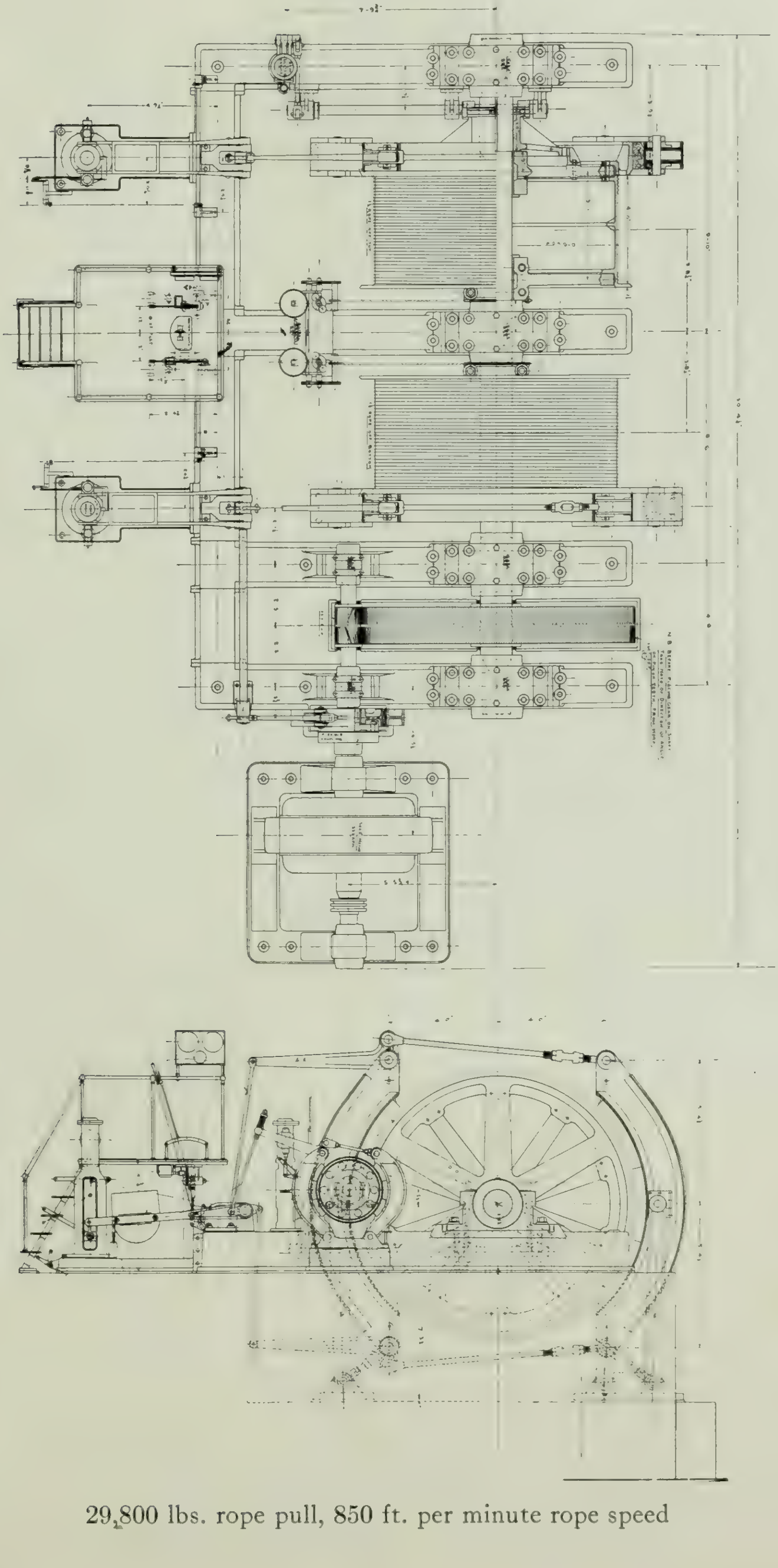
11,000 lbs. rope pull, 600 ft. per minute rope speed

Cut No. 16160



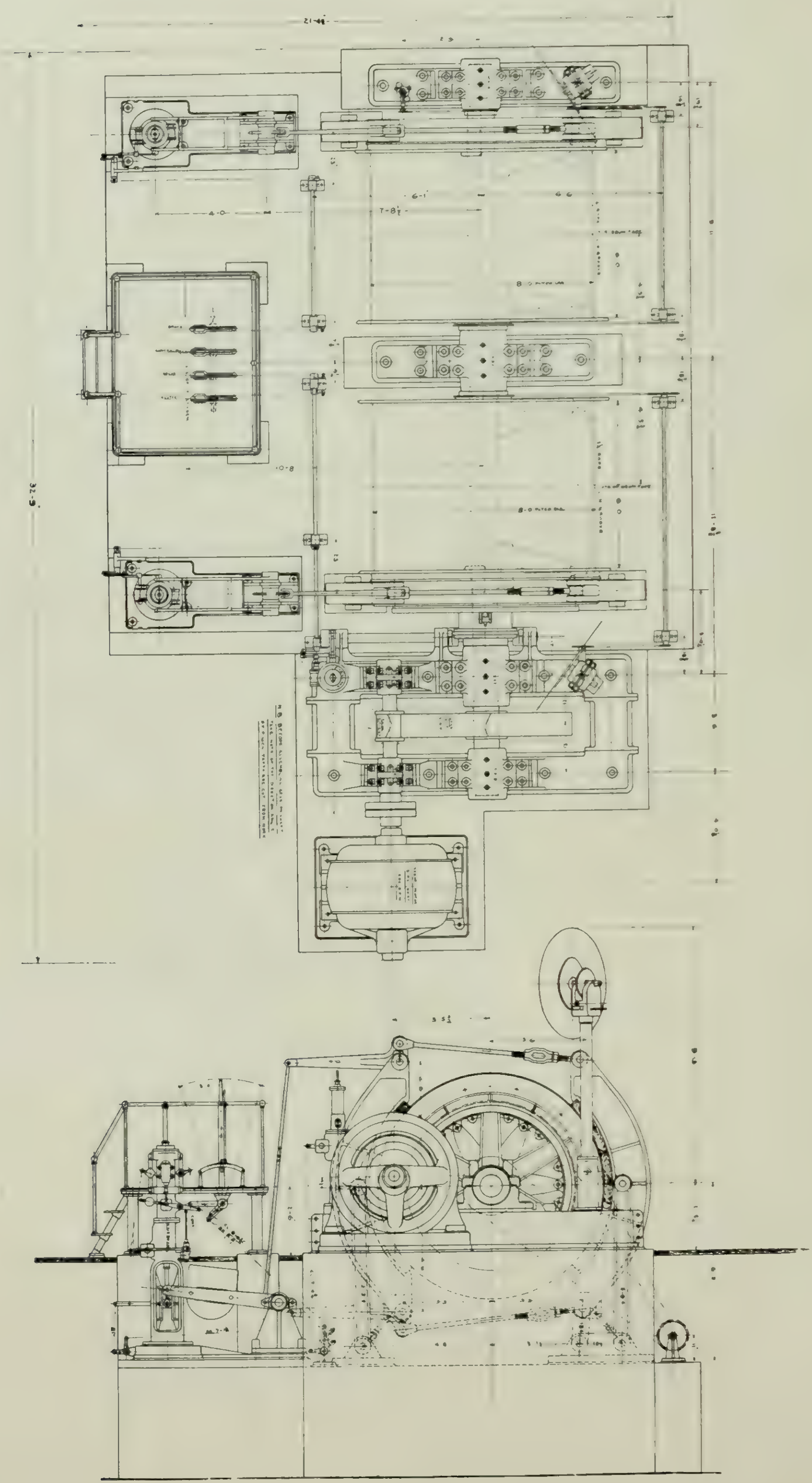
23,300 lbs. rope pull, 1,500 ft. per minute rope speed

Cut No. 16159



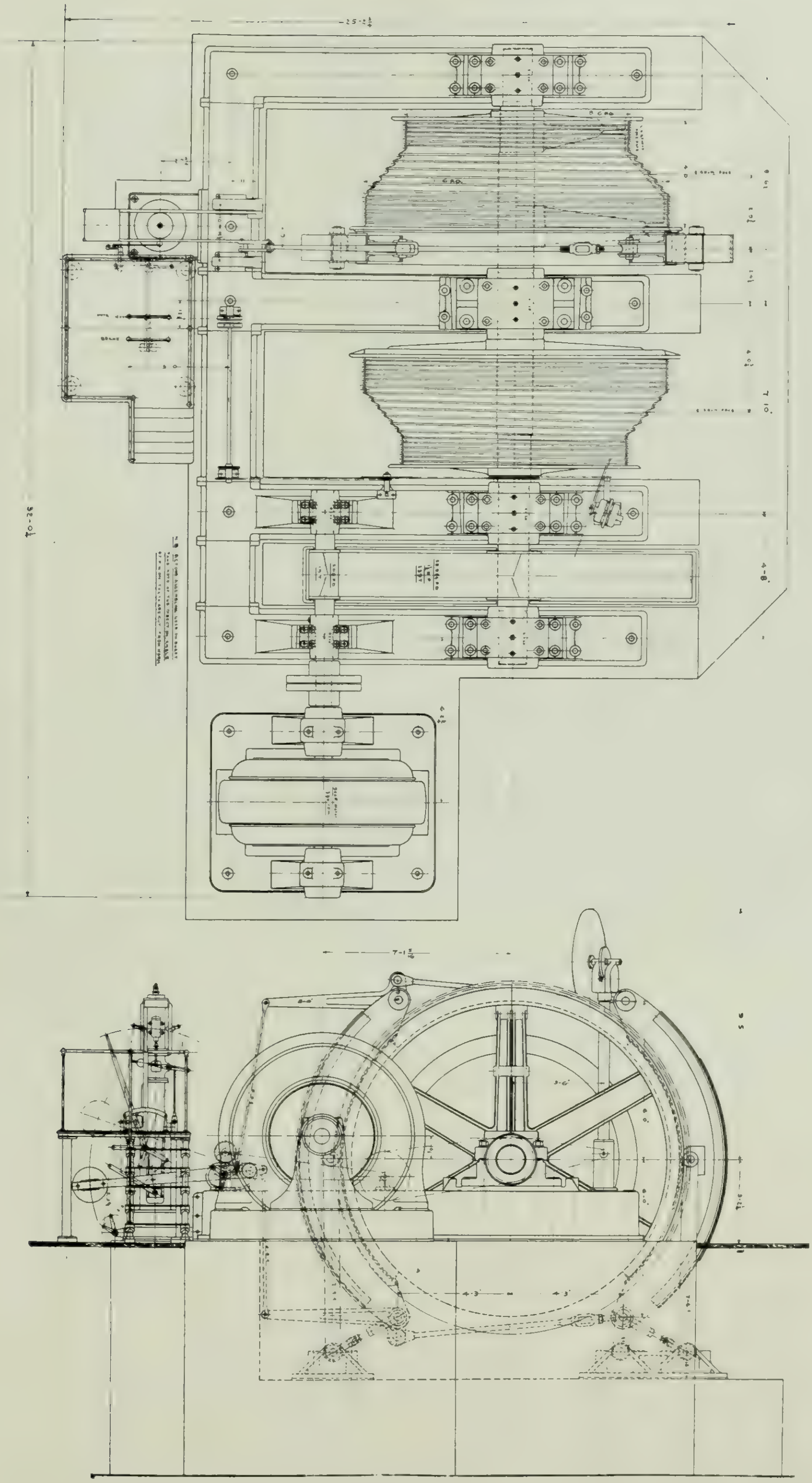
29,800 lbs. rope pull, 850 ft. per minute rope speed

Cut No. 16162



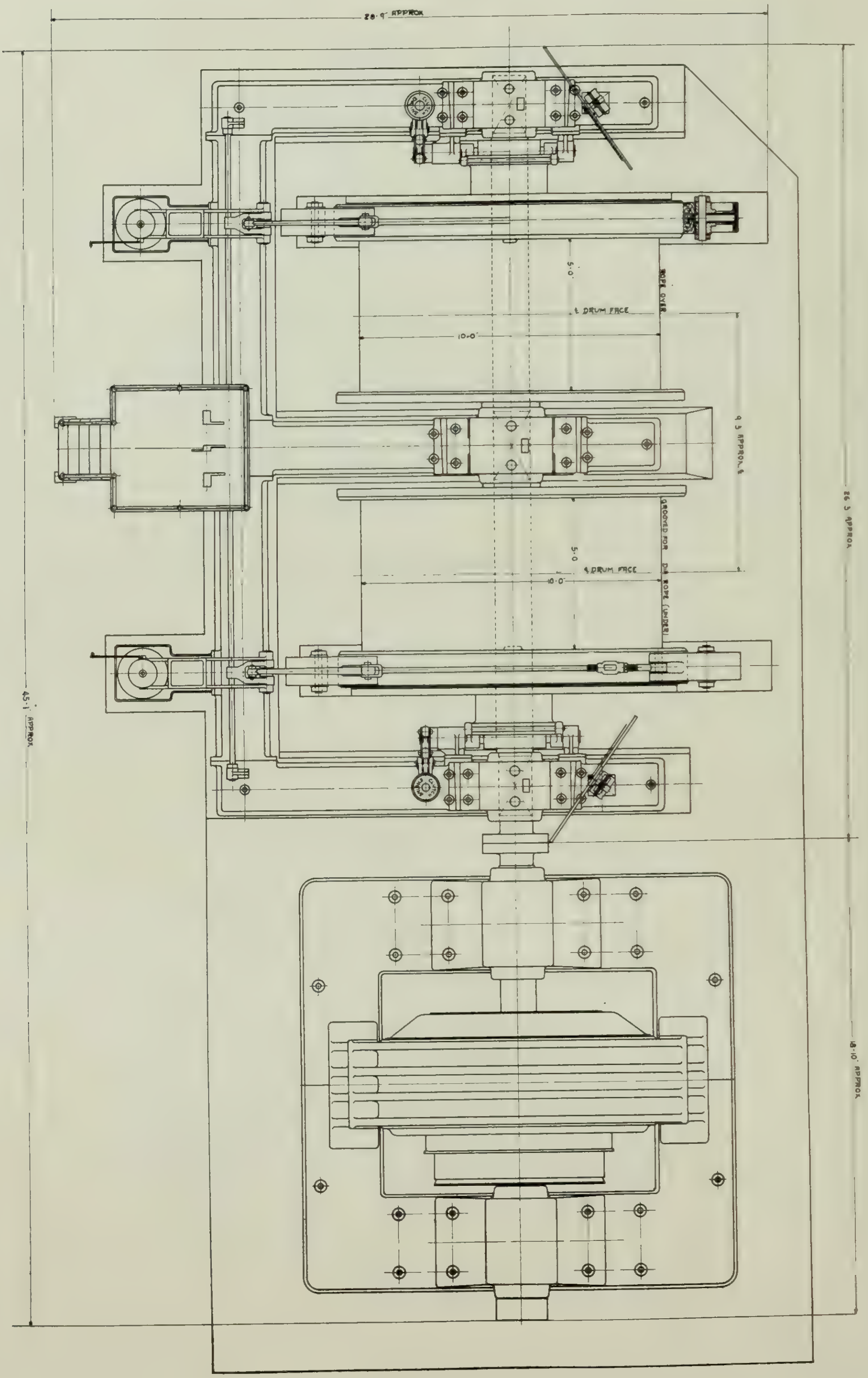
14,000 lbs. rope pull, 1,800 ft. per minute rope speed

Cut No. 16161



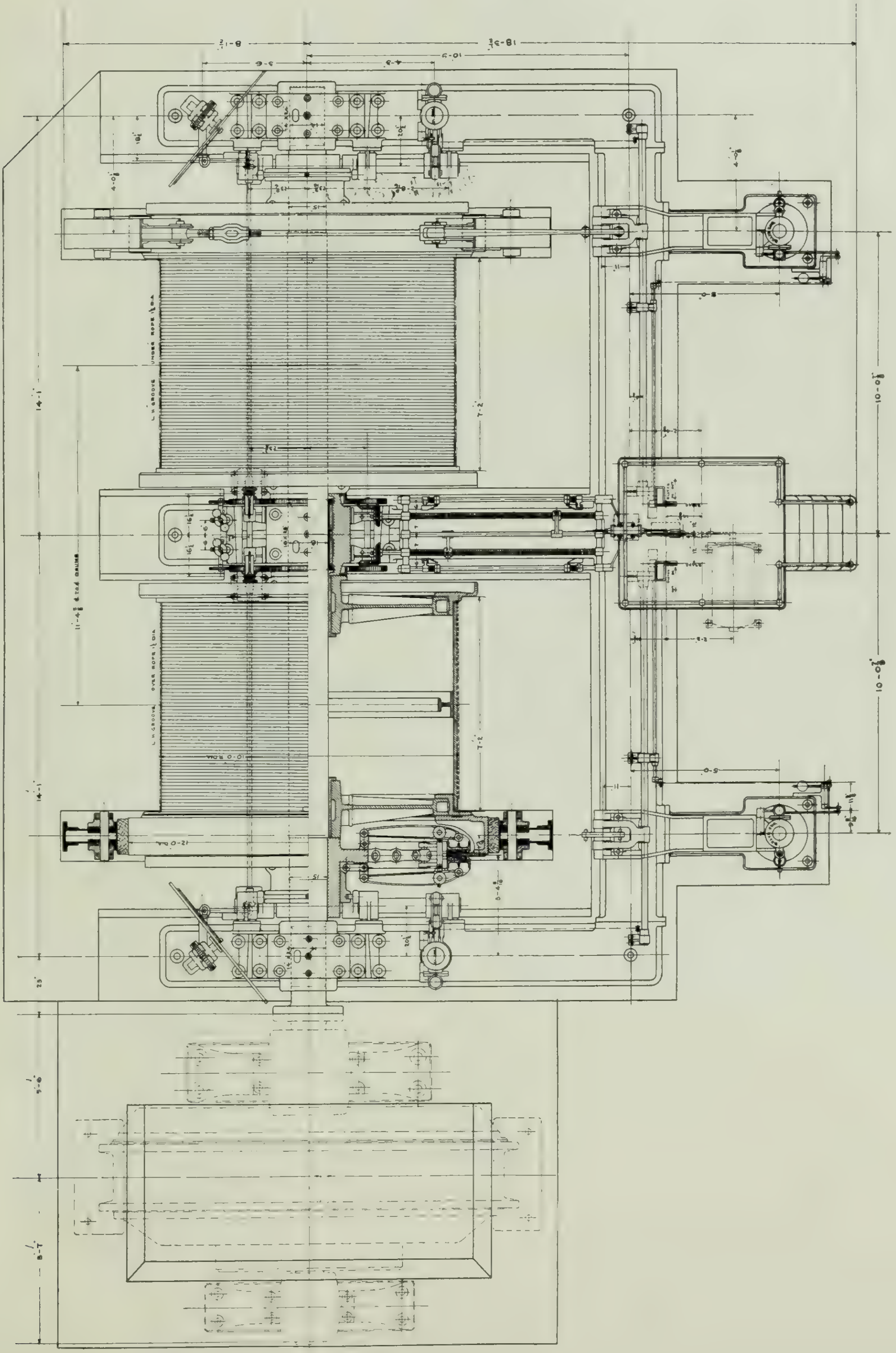
46,000 lbs. rope pull, 900 ft. per minute rope speed

Cut No. 16157



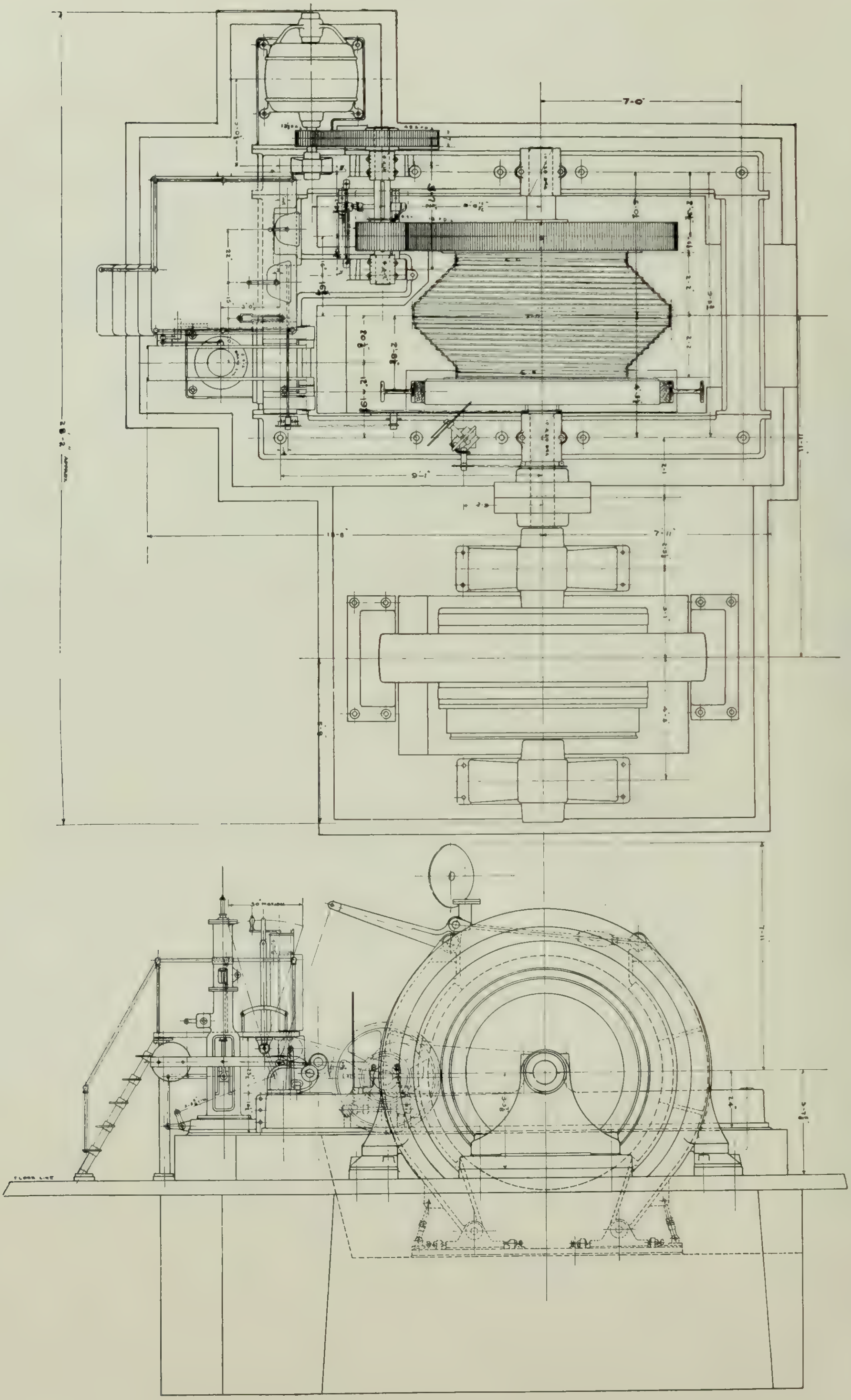
37,000 lbs. rope pull, 1,500 ft. per minute rope speed

Cut No. 16158



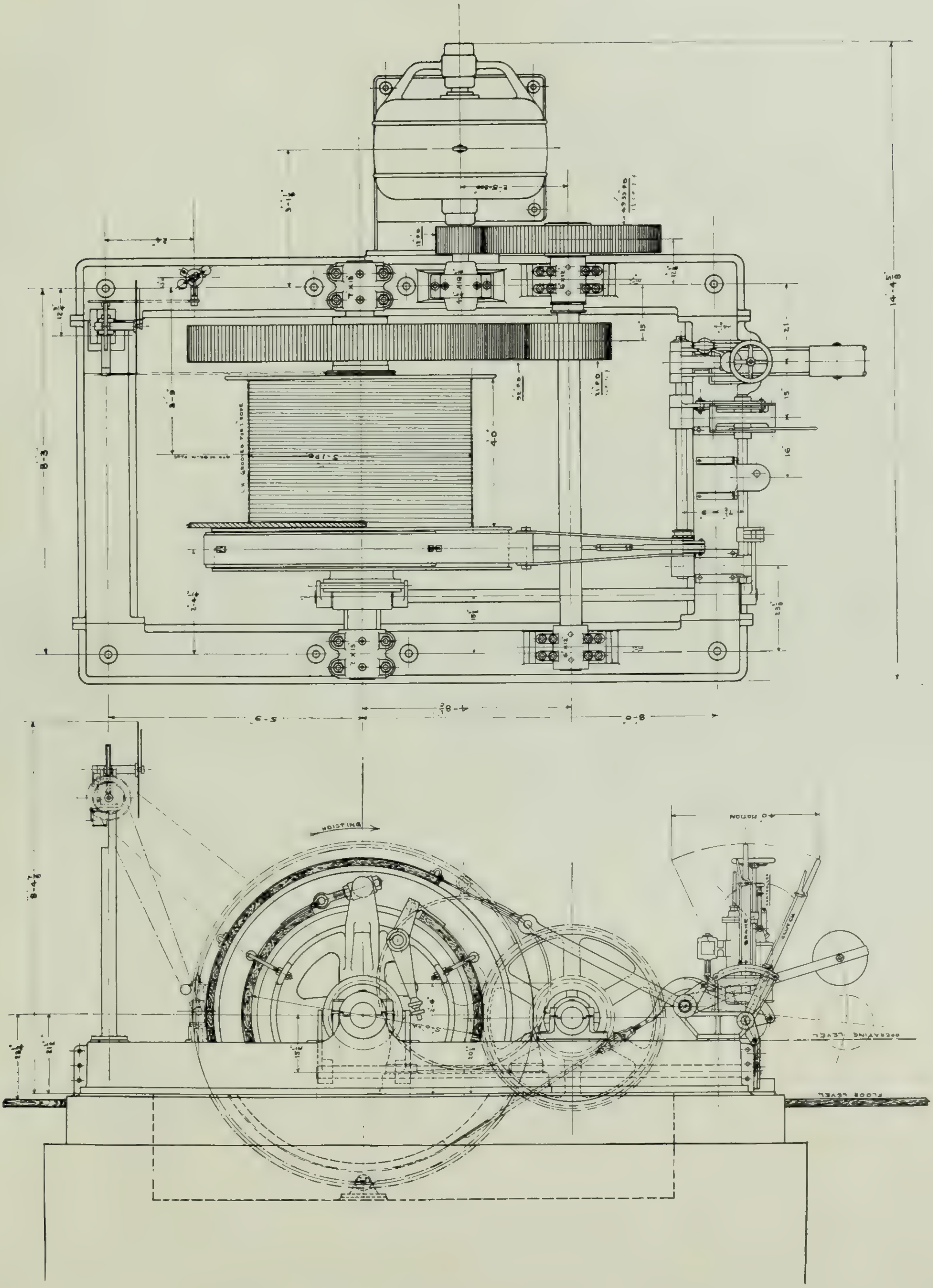
36,250 lbs. rope pull, 2,000 ft. per minute rope speed

Cut No. 11020



20,280 lbs. rope pull, 1,660 ft. per minute average rope speed

Cut No. 16170



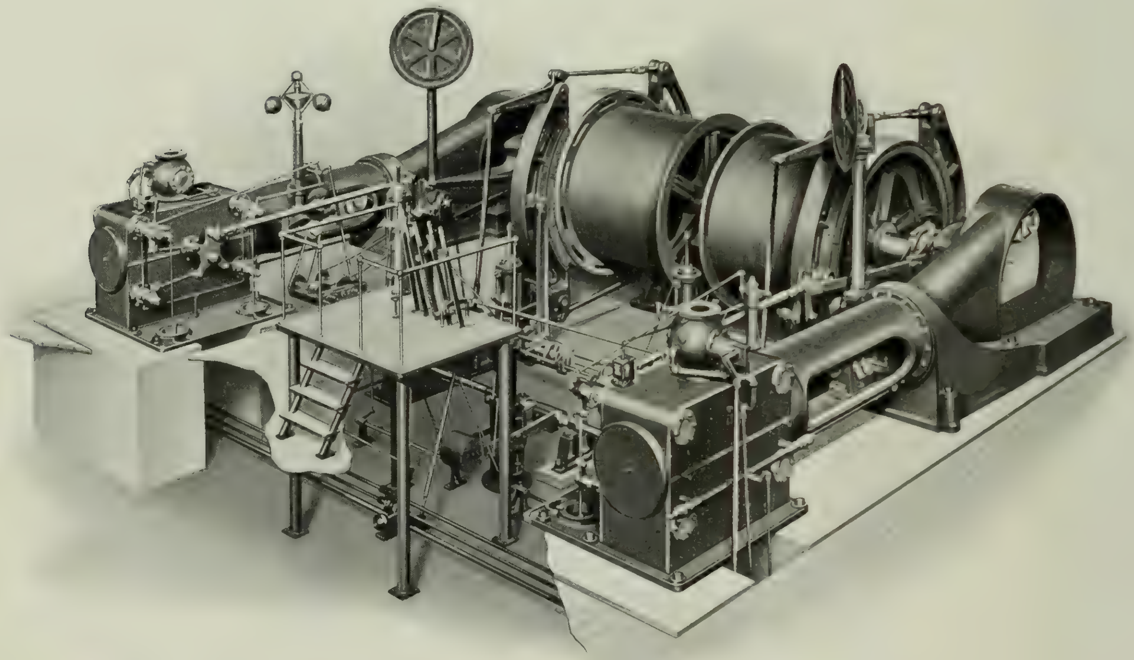
12,000 lbs. rope pull, 500 ft. per minute rope speed

STEAM DRIVEN HOIST
REYNOLDS-CORLISS HEAVY DUTY TYPE

BUILT FOR

BRITISH-AMERICAN NICKEL CORPORATION

Cut No. 15320

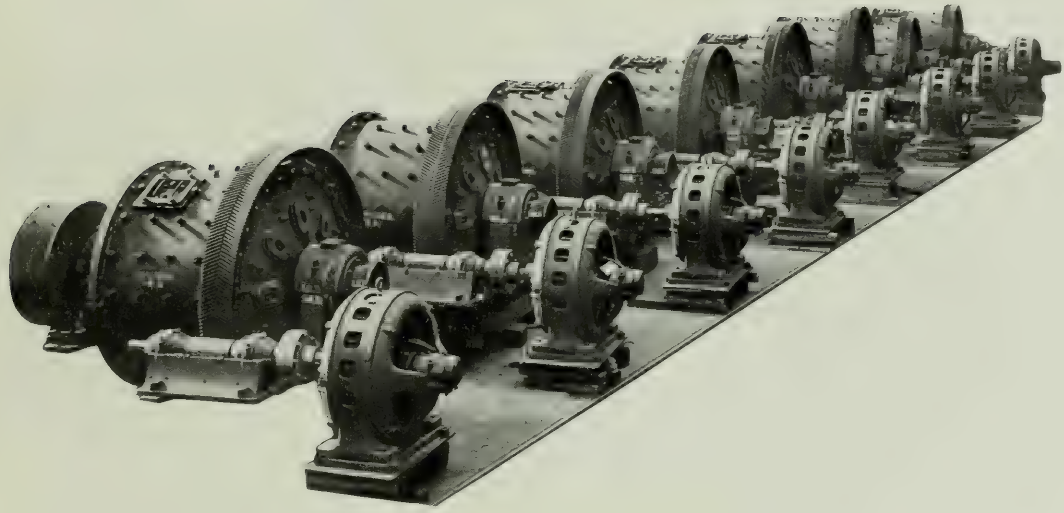


20,000 lbs. maximum rope pull, double drum duplex direct acting hoist. Cylinders 22″ x 48″. Drums 7′0″ dia. x 5′6″ face. Drums mounted on the same crankshaft, one keyed and one loose with friction clutch. Speed 800 ft. to 1,500 ft. per minute. Safety devices, etc.

Bulletin No. 1803-A describes CORLISS Steam Hoist.

BALL GRANULATORS

Cut No. 15676



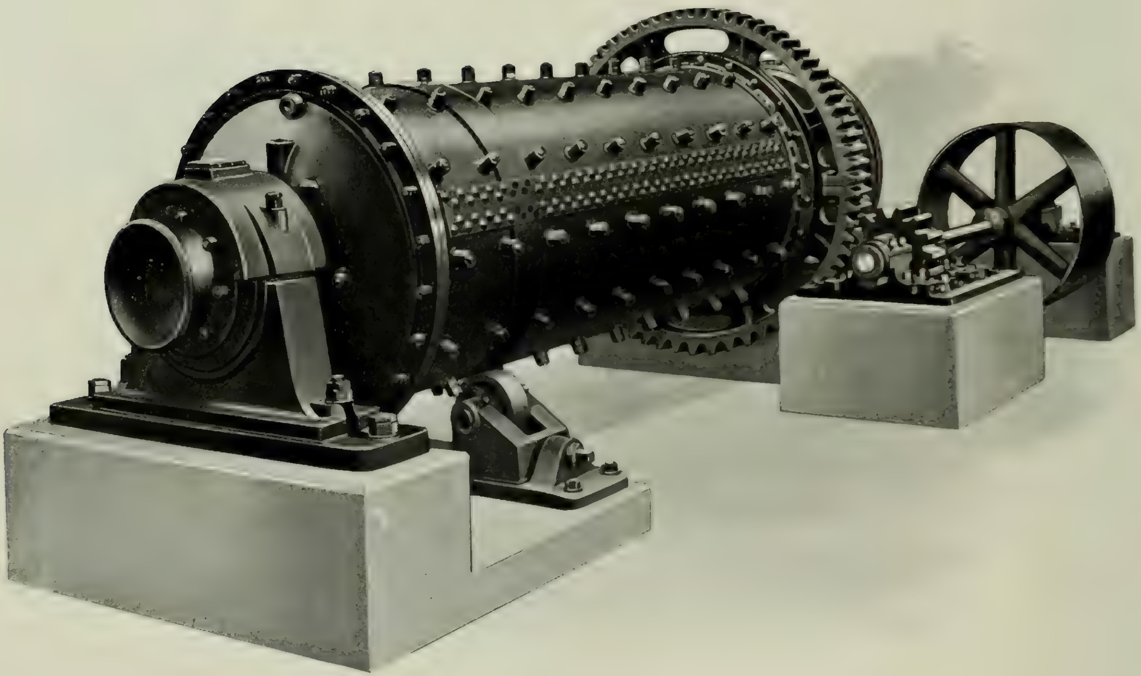
Complete order of Ball Granulators with Motors assembled before shipment.

Allis-Chalmers have developed a complete line of Ball Granulators for the reduction of ores, both wet and dry. Ranging in sizes from 3 feet to 8 feet in diameter and in lengths to suit the grinding conditions.

For details see our Bulletin 1813-A.

ROD MILLS

Cut No. 15775



(Trunnion Type)
View from discharge end

Allis-Chalmers manufacture a complete line of Rod Mills for both wet and dry grinding.

PROPOSED HOISTING PLANT

Please fill in the following information so that estimates can be intelligently made.

Customer ____________________

Location ____________________

Type of Hoist, steam or electrical ____________________

Geared or first motion ____________________

Single or Double Drum ____________________

Load
- Weight of skip ____________________
- " " cage ____________________
- " " car ____________________
- " " ore ____________________
- " " rope ____________________

Average speed desired ____________________

Shaft—Vertical or inclined ____________________

Degree of inclination from horizontal ____________________

Single or double compartment ____________________

Size of compartments ____________________

Present depth ____________________

Ultimate depth ____________________

Size and kind of rope to be used __________ dia. __________ stands __________ wires __________

Cages—In balance or independent ____________________

If in balance will hoist ever be called upon to operate unbalanced? If so, for how long at a time or for how many trips consecutively will it be necessary to operate unbalanced? ____________________

____

Type of clutch desired ____________________

Type of brake desired ____________________

Corliss or slide valve ____________________

Steam pressure available at engine ____________________

Electric current available at motor—alternating or direct ____________________

voltage ____________________

phase ____________________

cycle ____________________

time in operation ____________________

time required to load or unload ____________________

time of stop between hoisting periods ____________________

How far will hoist be located from center of shaft? ____________________

How high will head sheaves be above center line of hoist drums? ____________________

Will hoist be located towards side or end of shaft? ____________________

Remarks: ____________________

____

Signature ____________________ Date ____________________

PROPOSED HOISTING PLANT

Please fill in the following information so that estimates can be intelligently made.

Customer

Location

Type of Hoist, steam or electrical

Geared or first motion

Single or Double Drum

Load
  Weight of skip
  " " cage
  " " car
  " " ore
  " " rope

Average speed desired

Shaft—Vertical or inclined
  Degree of inclination from horizontal
  Single or double compartment
  Size of compartments
  Present depth
  Ultimate depth

Size and kind of rope to be used dia. stands wires

Cages—In balance or independent

If in balance will hoist ever be called upon to operate unbalanced? If so, for how long at a time or for how many trips consecutively will it be necessary to operate unbalanced?

Type of clutch desired

Type of brake desired

Corliss or slide valve

Steam pressure available at engine

Electric current available at motor—alternating or direct
  voltage
  phase
  cycle
  time in operation
  time required to load or unload
  time of stop between hoisting periods

How far will hoist be located from center of shaft?

How high will head sheaves be above center line of hoist drums?

Will hoist be located towards side or end of shaft?

Remarks:

Signature Date

PROPOSED HOISTING PLANT

Please fill in the following information so that estimates can be intelligently made.

Customer____

Location____

Type of Hoist, steam or electrical________________________________

Geared or first motion________________________________

Single or Double Drum________________________________

Load
- Weight of skip________________________________
- " " cage________________________________
- " " car________________________________
- " " ore________________________________
- " " rope________________________________

Average speed desired________________________________

Shaft—Vertical or inclined________________________________

Degree of inclination from horizontal________________________________

Single or double compartment________________________________

Size of compartments________________________________

Present depth________________________________

Ultimate depth________________________________

Size and kind of rope to be used____________dia.____________stands____________wires____________

Cages—In balance or independent________________________________

If in balance will hoist ever be called upon to operate unbalanced? If so, for how long at a time or for howmany trips consecutively will it be necessary to operate unbalanced?________________________________

____

Type of clutch desired________________________________

Type of brake desired________________________________

Corliss or slide valve________________________________

Steam pressure available at engine________________________________

Electric current available at motor—alternating or direct________________________________

voltage________________________________

phase________________________________

cycle________________________________

time in operation________________________________

time required to load or unload________________________________

time of stop between hoisting periods________________________________

How far will hoist be located from center of shaft?________________________________

How high will head sheaves be above center line of hoist drums?________________________________

Will hoist be located towards side or end of shaft?________________________________

Remarks:____

____

Signature________________________________Date________________

PROPOSED HOISTING PLANT

Please fill in the following information so that estimates can be intelligently made.

Customer
Location
Type of Hoist, steam or electrical
Geared or first motion
Single or Double Drum

Load
- Weight of skip
- " " cage
- " " car
- " " ore
- " " rope

Average speed desired
Shaft—Vertical or inclined
- Degree of inclination from horizontal
- Single or double compartment
- Size of compartments
- Present depth
- Ultimate depth

Size and kind of rope to be used dia. stands wires
Cages—In balance or independent
If in balance will hoist ever be called upon to operate unbalanced? If so, for how long at a time or for how many trips consecutively will it be necessary to operate unbalanced?

Type of clutch desired
Type of brake desired
Corliss or slide valve
Steam pressure available at engine
Electric current available at motor—alternating or direct
- voltage
- phase
- cycle
- time in operation
- time required to load or unload
- time of stop between hoisting periods

How far will hoist be located from center of shaft?
How high will head sheaves be above center line of hoist drums?
Will hoist be located towards side or end of shaft?
Remarks:

Signature Date

Allis-Chalmers Manufacturing Company's

PRINCIPAL PRODUCTS

AGRICULTURAL MACHINERY
Farm Tractors

AIR BRAKES

AIR COMPRESSORS
Steam Driven
Belt Driven
Electrically Driven, Portable
Electrically Driven, Stationary
Hydraulic Driven

CEMENT MACHINERY
Ball Mills
Ball Tube Mills
Balls, Forged
Compeb Mills
Crushing Rolls
Elevators
Feeders
Gyratory Breakers
Hoists
Mixing Pans
Perforated Metals
Revolving Screens
Rotary Coolers and Dryers
Rotary Kilns
Tube Mills
Tube Mill Linings
Tube Mill Pebbles

COAL MINING MACHINERY
Barney Cars
Crushing Rolls
Hoisting Cages
Revolving Screens
Shaking Screens

CONDENSERS
Barometric
Jet
Surface

CRUSHING MACHINERY
Ballast Plants
Crushing Rolls
Dumping Skips
Elevators
Gyratory Breakers
Jaw Crushers
Macadam Plants
Perforated Metals
Portable Crushing Plants
Revolving Screens
Quarry Cars

ENGINES
Corliss Engines
Gas Engines
Diesel Oil Engines
Blowing Engines
Rolling Mill Engines

FORGINGS

PERFORATED METALS

FLOUR MILL MACHINERY
Aspirators
Bolters, Universal
Bolting Cloth
Bolting Cloth Cleaners
Bran and Shorts Dusters
Bran Packers
Conveyors, Spiral
Corn Mills
Fans
Feed Mills
Feed Screens
Flour Dressers
Flaking Machines
Flour Feeders and Mixers
Flour Packers
Granulators
Purifiers
Reels
Rolls
Roller Mills
Rolling Screens
Scalpers

HOISTS
Electric Driven
Steam Driven

HYDRAULIC MACHINERY
Francis Turbines
Impulse Wheels
Oil Pressure Governors
Pressure Regulators
Accessories

MANGANESE BRONZE CASTINGS

MINING MACHINERY
Amalgam Appliances
Ball Granulators
Chilian Mills
Concentrating Plants
Conveyors
Copper Converting Plants
Cyanide Plants
Elevators
Gold and Silver Mills
Gyratory Breakers
Huntington Mills
Jaw Crushers
Jigs
Lead Refining Plants
Mine Ventilating Machinery
Mortar Mills
Ore Buckets
Ore Feeders
Prospecting Mills
Roasting Furnaces
Sampling Plants
Skips
Smelting Machinery
Stamps, Atmospheric
Stamps, Gravity
Stamps, Steam
Tube Mills, Wet and Dry
Vanners

POWER TRANSMISSION MACHINERY
Belt Tighteners
Boxes
Couplings
Gears
Hangers
Pulleys
Rope Sheaves
Shafting

PUMPING MACHINERY
Centrifugal Pumps
Fire Service Pumps
Geared Pumps
"High Duty" Pumping Engines
Hydraulic Transmission Pumps
Screw Pumps

ROLLING MILL MACHINERY

SAW MILL MACHINERY
Band Mills, Double Cutting
Band Mills, Single Cutting
Band Mills, Telescopic
Band Re-saws, Horizontal
Band Re-saws, Vertical
Board Lifters, Steam
Cant Flippers, Steam
Canting Machine, Overhead
Carriages
Circular Saw Mills
Conveying Machinery
Cutting Off Saws, Steam Feed
Edgers
Edging Grinders
Feeds, Steam, Direct Acting
Feeds, Steam, Twin Engine
Filing Room Tools
Lath Mills and Bolters
Live Rolls and Drives
Log Chains
Log Jacks
Log Loaders
Log Turners
Niggers, Steam
Set Works
Slashers
Steam Feed Valves
Stock Lifters, Steam
Transfers
Trimmers

SUGAR MACHINERY

TIMBER TREATING AND PRESERVING MACHINERY

TURBINES—STEAM

TURBINES—WATER

ELECTRICAL APPARATUS

ALTERNATING CURRENT GENERATORS AND MOTORS

Belted Type Generators
Engine Type Generators
Fly-wheel Type Generators
Turbo Generators
Water-wheel Type Generators
Synchronous Frequency Changers
Induction Motor Frequency Changers
Synchronous Motor-Generator Sets
Induction Motor-Generator Sets
Synchronous Motors
Synchronous Condensers
Induction Motors
Transformers
Rotary Converters

DIRECT CURRENT GENERATORS AND MOTORS

Belted Type Generators
Engine Type Generators
Small Bipolar and Multipolar Motors and Generators
Electric Railway Equipments, Motors, Controllers, etc.
Multiple Voltage Balancing Sets
Multiple Voltage Variable Speed Equipments

SWITCHBOARDS FOR DIRECT CURRENT AND ALTERNATING CURRENT

Allis-Chalmers Manufacturing Company

General Offices, ... Milwaukee, Wis.

DISTRICT OFFICES

Atlanta, Ga., 1104-1106 Healey Bldg.
Birmingham, Ala., 1010-1012 Brown-Marx Bldg.
Boston, Mass., 723-724 State Mutual Bldg.
Buffalo, N. Y., 574-576 Ellicott Square Bldg.
Charlotte, N. C., 212 Chamber of Commerce Bldg.
Chicago, Ill., 1319½-1337 Peoples Gas Bldg.
Cincinnati, O., 1720 First National Bank Bldg.
Cleveland, O., 1119-1121 Schofield Bldg.
Dallas, Texas, 510 Sumpter Bldg.
Denver, Colo., 316 Foster Bldg.
Detroit, Mich., 1828-1829 Ford Bldg.
Duluth, Minn., 709 Alworth Bldg.
Kansas City, Mo., 1410-1412 Waldheim Bldg.
Los Angeles, Cal., 623-625 Title Insurance Bldg.
Milwaukee, Wis., West Allis Works.
Minneapolis, Minn., 707-711 Metropolitan Life Bldg.
New Orleans, La., 719-723 Maison Blanche Bldg.
New York, N. Y., 50 Church Street.
Philadelphia, Pa., 806-810 Franklin Trust Bldg.
Pittsburgh, Pa., 1207-1210 Park Bldg.
Portland, Ore., 604-606 Lumbermen's Bldg.
St. Louis, Mo., 2188-2189 Railway Exchange Bldg.
Salt Lake City, Utah, 608-610 Kearns Bldg.
San Francisco, Cal., 741-751 Rialto Bldg.
Seattle, Wash., 115 Jackson Street.
Toledo, O., 819 Ohio Bldg.
Wilkes-Barre, Pa., 904 Coal Exchange Bldg.

FARM TRACTOR DISTRICT OFFICES

Allis-Chalmers Mfg. Co., 1101-1103 Patterson Ave., Dallas, Texas.
Allis-Chalmers Mfg. Co., 205-207 West 9th St., Des Moines, Iowa.
Allis-Chalmers Mfg. Co., 707 Metropolitan Life Bldg., Minneapolis, Minn.

FOREIGN DISTRICT OFFICES

London, England, 728 Salisbury House, London Wall, E. C. 2
Paris, France, 3 Rue Taitbout.
Rio de Janeiro, Brazil, Caixa 220.
Santiago, Chile, Calle Bandera 261, Casilla 2653.

CANADIAN REPRESENTATIVES

Canadian Allis-Chalmers, Limited:
Toronto, Ontario

FOREIGN SALES AGENCIES

Shanghai, China	American Trading Company, 25 Broad St., New York
Hankow, China	American Trading Company, 25 Broad St., New York
Pekin, China	American Trading Company, 25 Broad St., New York
Tientsin, China	American Trading Company, 25 Broad St., New York
Tokyo, Japan	American Trading Company, 25 Broad St., New York
Kobe, Japan	American Trading Company, 25 Broad St., New York
Yokohama, Japan	American Trading Company, 25 Broad St., New York
Johannesburg, South Africa	Herbert Ainsworth
Turin, Italy	Mario Axerio
Mexico City, Mexico	R. E. Briggs Co., S. A.
Christiana, Norway	Fosen, Oxaal & Co., Ltd.
Madrid, Spain	Gumersindo Garcia
Lisbon, Portugal	Monteiro Gomes, Limitada, 15-17 East 40th St., New York
Honolulu, Hawaii	Honolulu Iron Works
Manila, P. I.	Honolulu Iron Works
Perth, West Australia	Frank R. Perrot
Sydney, New South Wales, Australia	Frank R. Perrot
Singapore, Federated Malay States	Robertson-Cole Co., Singer Bldg., New York
French Indo China	Robertson-Cole Co., Singer Bldg., New York
Siam	Robertson-Cole Co., Singer Bldg., New York
Antofagasta, Chile	Suc. J. K. Robinson, 140 Front St., New York, N. Y.
Iquique, Chile	Suc. J. K. Robinson, 140 Front St., New York, N. Y.
Havana, Cuba	Thrall Electric Company